VOL. 12

New
Nouveau Brunswick

AGRICULTURE

ADAPTIVE RESEARCH REPORTS

RAPPORTS DE RECHERCHES SUR L'ADAPTATION

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1990

Plant Industry Branch
Direction de l'industrie végétale

VOL. 12

1990 ADAPTIVE RESEARCH REPORTS

RAPPORTS DE RECHERCHES SUR L'ADAPTATION 1990

PLANT INDUSTRY BRANCH
DIRECTION DE L'NDUSTRIE VÉGÉTALE
New Brunswick Department of Agriculture
Ministère de l'Agriculture du Nouveau-Brunswick

ROBERT W. SAINTONGE
Deputy Minister
Sous-ministre

ALAN R. GRAHAM
Minister of Agriculture
Ministre de l'Agriculture

FOREWORD

This is the twelfth edition of the Adaptive Research Report. Each year the plant Industry Branch publishes the results of various projects conducted by staff members for use by farmers and agrologists.

The reports cover technology transfer activities conducted by the three sections of the Plant Industry Branch, namely Horticulture, Plant Health and Field Crops. Some papers from the NBDA Land Resources Branch and the Potato Development Directorate which were formed in 1990 are also included.

I wish to acknowledge the efforts of staff in conducting the trials and extend thanks to all producers and organizations that cooperated in the projects. A special recognition is made to Branch secretaries for typing the reports.

The financial funding of the cost-shared Canada-New Brunswick Agri-Food Development Subsidiary Agreement and the Canada-New Brunswick Livestock Feed Development Agreement are acknowledged in supporting many of the projects.

This 1990 Report is brought together and published through very capable efforts of the editor, Roger Tremblay.

E. T. Pratt
Executive Director
Plant Industry Branch
N.B. Dept. of Agriculture
Fredericton, NB

PRÉFACE

La Direction de l'industrie végétale publie chaque année les résultats des divers projets réalisés par son personnel, et nous offrons aux agriculteurs et aux agronomes la douzième édition des rapports de recherches sur l'adaptation.

Ces rapports portent sur les activités de transfert de technologie réalisées par les trois sections de la Direction de l'industrie végétale, soit l'Horticulture, la Santé des végétaux et les Grandes cultures. Ils comprennent aussi quelques résultats de recherches provenant de la Direction des ressources des terres agricoles et de la Section du développement de la pomme de terre, qui ont été mises sur pied en 1990 et qui relèvent du ministère de l'Agriculture du Nouveau-Brunswick.

Nous remercions tous les producteurs et organismes qui ont collaboré aux projets, sans oublier l'excellent travail du personnel chargé des essais. Une mention spéciale s'adresse aux secrétaires de la Direction qui ont dactylographié les rapports.

Nous voulons également souligner la contribution financière accordée pour un grand nombre de ces projets en vertu de l'entente auxiliaire Canada/Nouveau-Brunswick sur le développement du secteur agro-alimentaire et de l'entente Canada/Nouveau-Brunswick sur le développement du secteur des provendes.

On doit aussi mentionner la compétence avec laquelle M. Roger Tremblay, chargé de publication, s'est occupé de la compilation et de la publication des rapports.

E. T. Pratt
Directeur général
Direction de l'industrie végétale
Ministère de l'Agriculture du Nouveau-Brunswick
Fredericton (Nouveau-Brunswick)

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GENERAL

THE 1990 GROWING SEASON

George Read

ABSTRACT: The 1990 Growing season was generally very wet in the spring, late summer and fall, with an extended dry period from June to mid-July. Heat units were slightly above normal with normal spring frosts and late fall frosts.

SAISON DE CULTURE DE 1990

Résumé: La saison de culture de 1990 a été généralement très humide au printemps, à la fin de l'été et à l'automne, mais elle a été entrecoupée par une période prolongée de temps sec entre juin à la mi-juillet. Le nombre de degrés-jours était un peu supérieur à la normale, et les gelées du printemps et de la fin d'automne ne s'écartaient pas de la normale.

INTRODUCTION: Generalizing the weather conditions for and entire province for an entire season does not explain crop performance on individual farms or even separate regions for the most part. The climate of farms varies significantly from one location to another with such things as frost occurrence, crop development, planting, insect and disease development or harvesting operations. It is therefore necessary to evaluate specific varieties, recommendations and production practices with the most localized or representative information as possible.

Despite these farm scale influences, the overall performance of crops on a provincial scale can often be correlated with major deviations from normal growing season conditions, such as droughts, wet periods, extensive frosts or unusually warm or cold seasons. With these factors recognized, a general summary of the 1988 cropping season weather is presented.

SUMMARY: With the exception of the extreme Northwestern part of the province, which was near normal, the month of May was very wet. Some locations received almost 300 % of normal with most ranging from 150 to 225 % above normal. After a warm period in late April-early May, heat units accumulations for the month were slighly above normal.

June was slightly above normal in temperature and well below normal in rainfall throughout most of the province, except for the upper Saint John river valley. The period from June 1st to June 20th was very dry.

Although total rainfall for the month was generally well above normal this is a bit misleading, as many locations continued very dry for the first three weeks of July. This situation combined with a dry June resulted in low moisture status of many soils. Heat units continued to increase and accumulated values from May 1st were generally 5 to 10 % above seasonal values, slightly higher in the North.

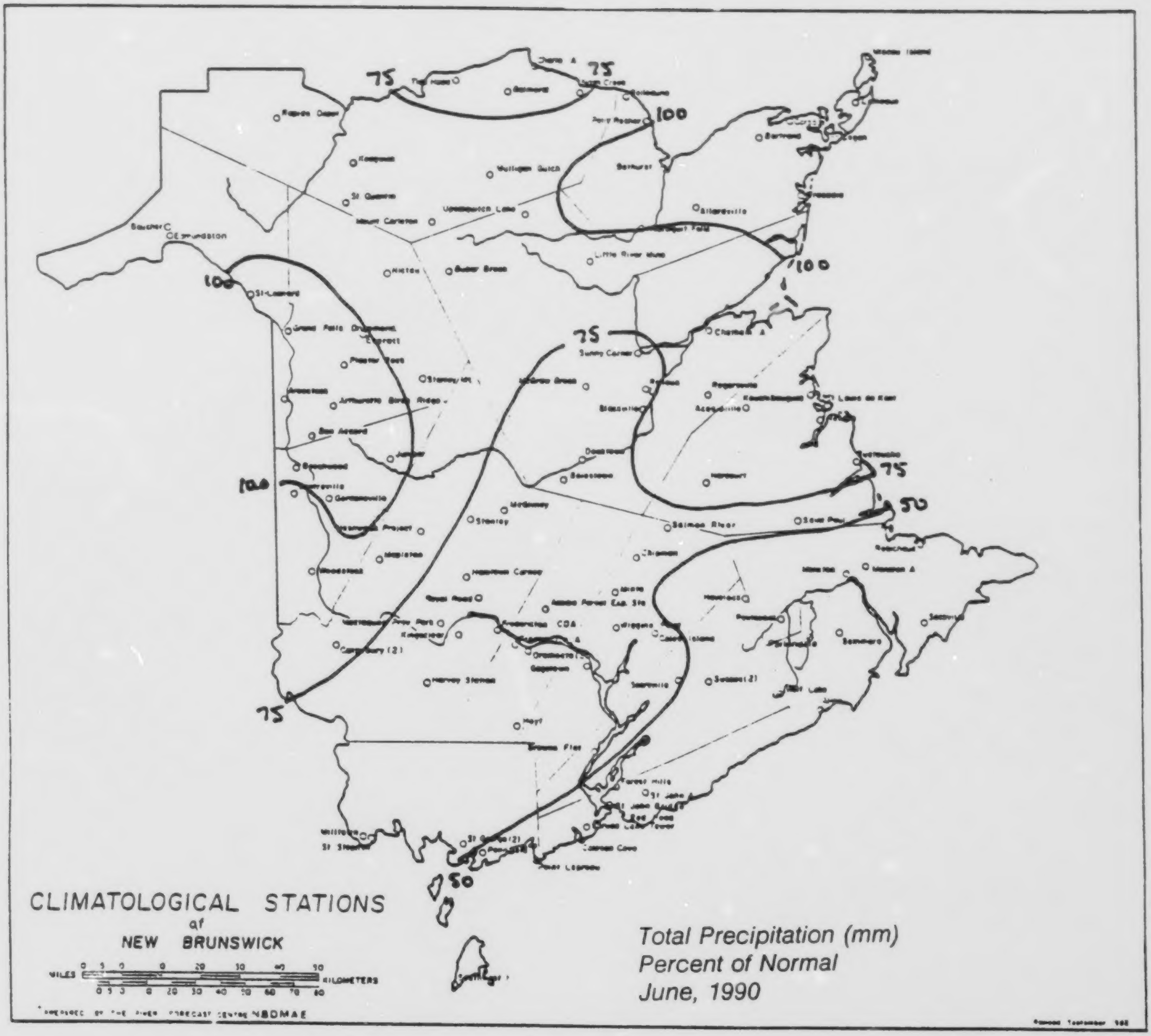
Rainfall was highly variable in August, indicating several thunderstorm type of events. Woodstock had over 300 mm of rainfall compared to a normal of 82.9 mm. St. Stephen, Sussex, and Saint John were all well below normal for the month. The rest of the province was slightly to well above normal. Heat units were above normal (approx 10%) for this time of year.

September rainfall and temperatures were near normal. Accumulated Growing Degree-days and Corn Heat Units were generally 5 - 15 % above normal for the May 1st - September 30th period.

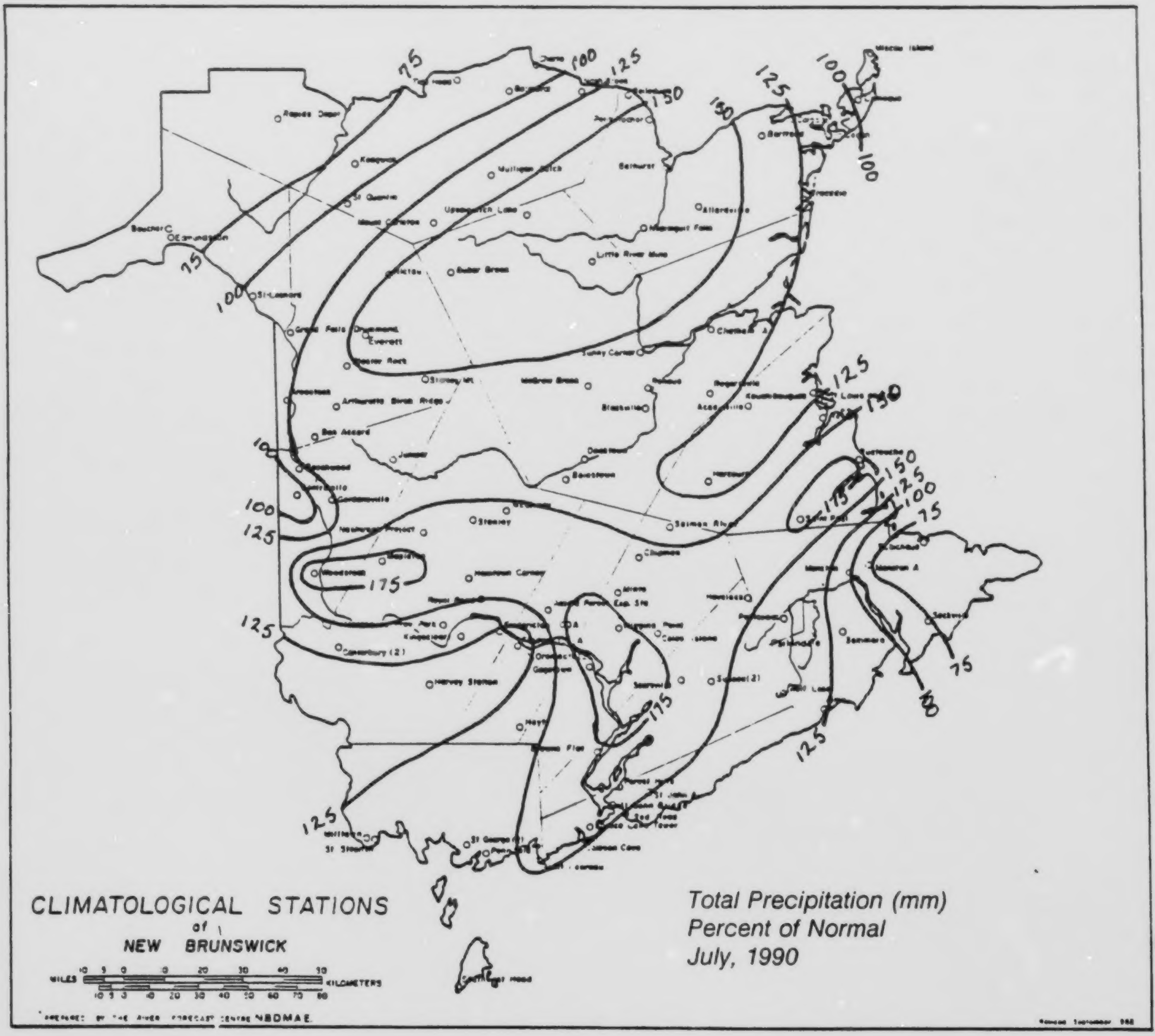
Slight frosts were recorded in early September, however a heavy frost was not recorded until mid-October.

The month of October was very poor for harvesting operations. The first 23 days of October recorded rainfall on 22 days, not permitting any significant drying out of wet soils.

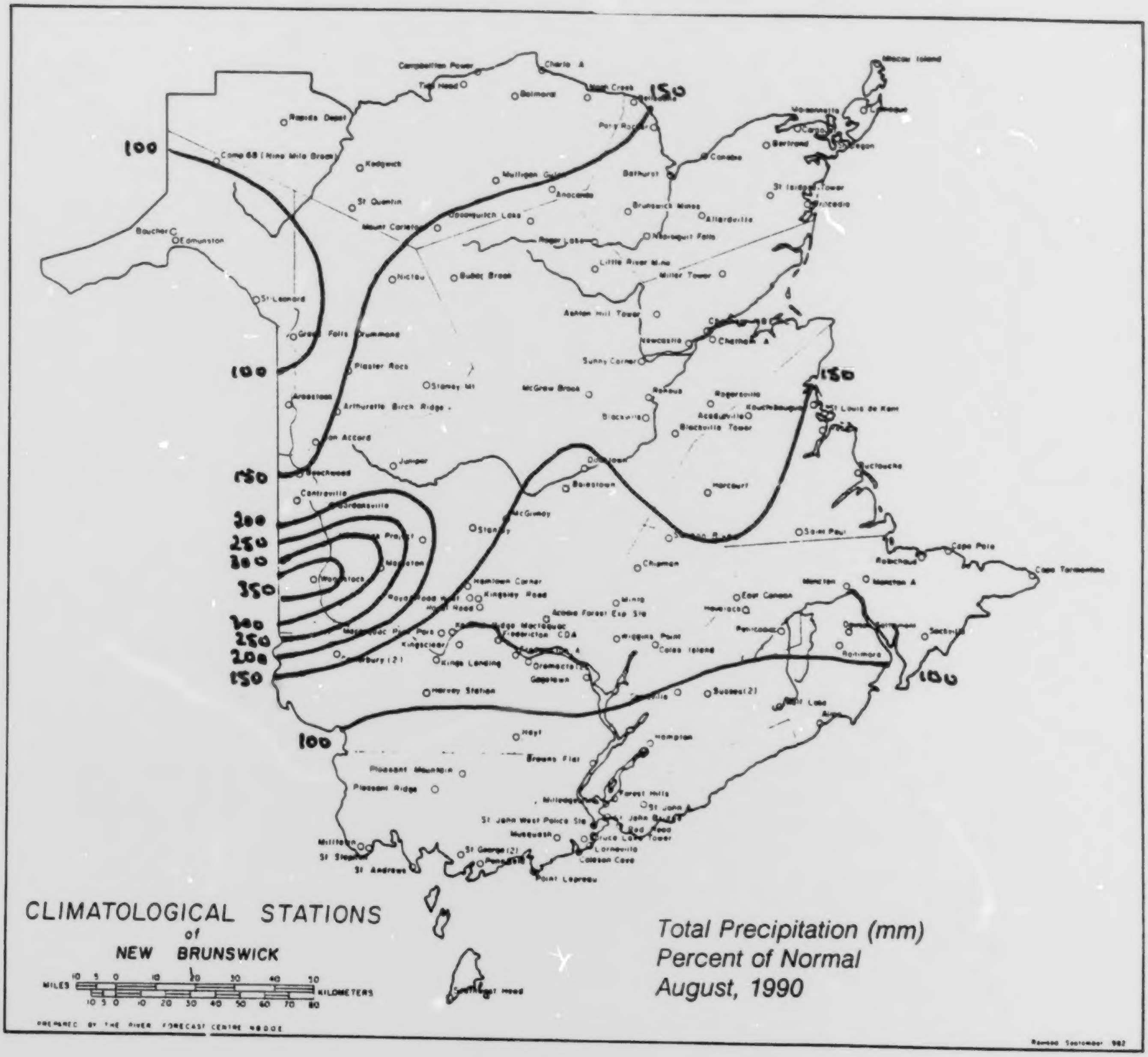
MAPS: The following maps, courtesy of the New Brunswick Department of the Environment and data courtesy of Environment Canada, depict precipitation values as a percent of normal for the months of May, June, July, August, and September, October and November for 1990. The results are based on unverified reports.


CLIMATOLOGICAL STATIONS
of
NEW BRUNSWICK
MILES
KILOMETERS
75
75
100
100
100
100
75
75
50
50
75

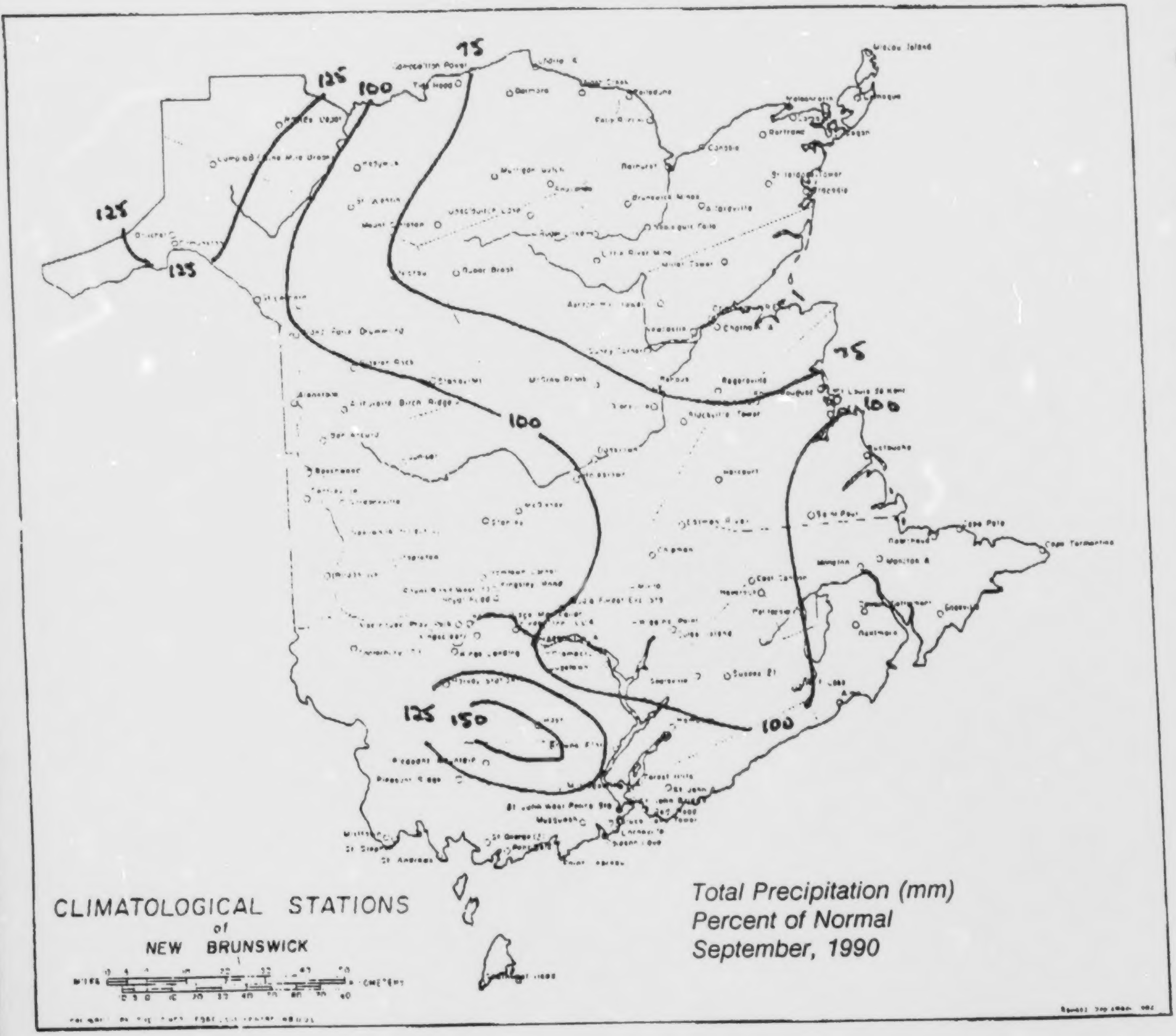
Total Precipitation (mm)
Percent of Normal
June, 1990


75
100
125
150
175
St-Leonard
Edmundston
St Quentin
Kedgwick
Mulligan Gulch
Bathurst
Mount Carleton
Allardville
Little River Mine
Sugar Brook
Everett
Chatham A
Sunny Corner
Blackville
Doaktown
Boiestown
Bon Accord
Stanley
Salmon River
Chipman
Woodstock
Harvey Station
Canterbury (2)
Sussex (2)
Moncton
Sackville
St John
St Stephen
St George
CLIMATOLOGICAL STATIONS
of
NEW BRUNSWICK
MILES
KILOMETERS
10 5 0 10 20 30 40 50
10 5 0 10 20 30 40 50 60 70 80
PREPARED BY THE RIVER FORECAST CENTRE NBDMAE

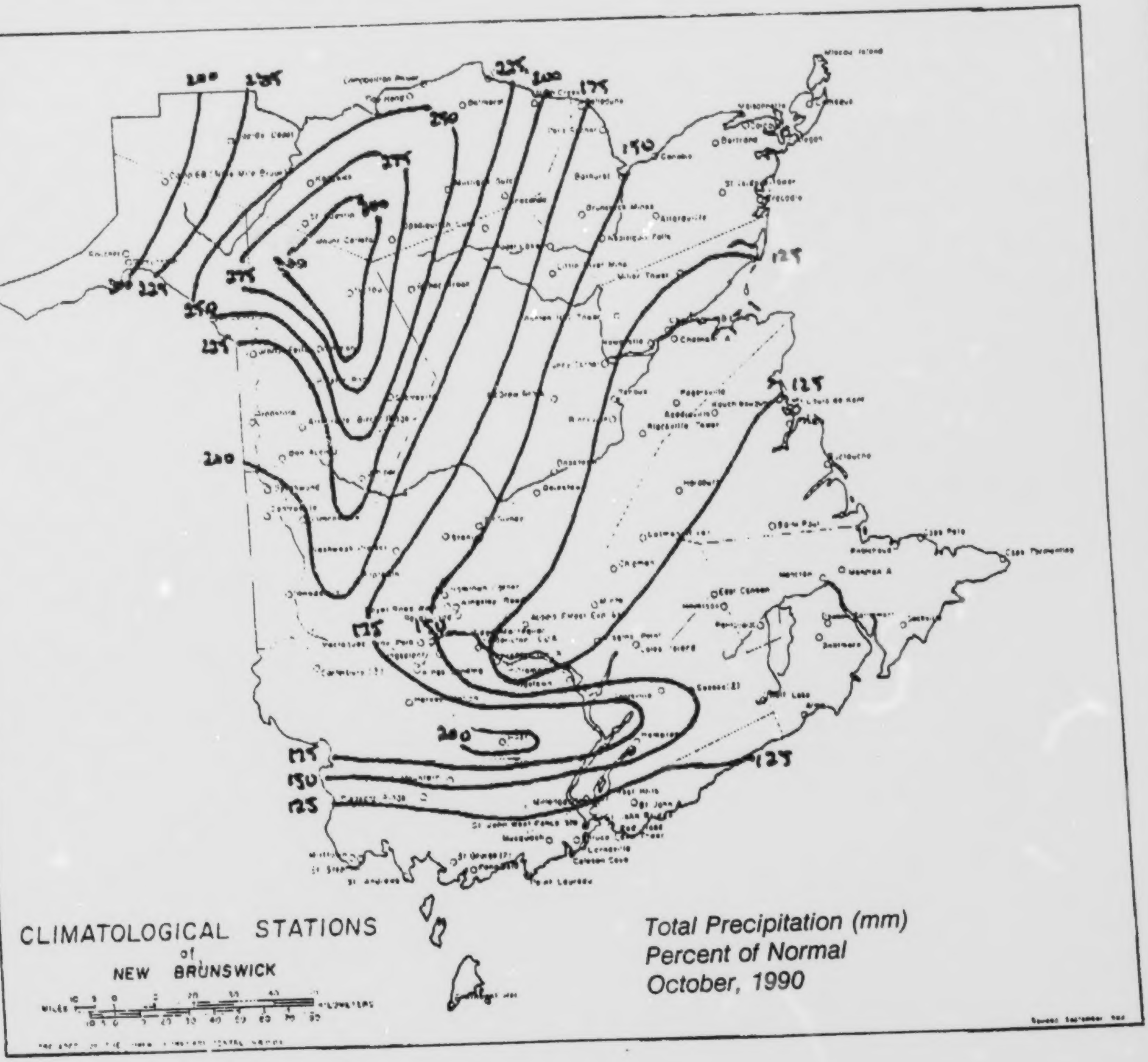
Total Precipitation (mm)
Percent of Normal
July, 1990


CLIMATOLOGICAL STATIONS
of
NEW BRUNSWICK
MILES
KILOMETERS
100
150
200
250
300
350
Campbellton Power
Charlo A
Tide Head
Balmoral
Nash Creek
Belledune
Rapids Depot
Como 68 (Nine Mile Brook)
Kedgwick
Mulligan Gulch
Anaconda
St Quentin
Mount Carleton
Popple Depot
Bathurst
Brunswick Mines
Allardville
Nepisiguit Falls
Little River Mine
Miller Tower
Baker Brook
Edmundston
St Leonard
Nictau
Grand Falls Drummond
Plaster Rock
Stoney Mt
McGraw Brook
Ashton Hill Tower
Newcastle
Chatham A
Sunny Corner
Aroostook
Arthurette Birch Ridge
Bon Accord
Juniper
Blackville
Blackville Tower
Rogersville
Acadieville
Kouchibouguac
St Louis de Kent
Beechwood
Centreville
Bairdsville
Doaktown
Boiestown
Harcourt
Buctouche
Saint Paul
McGivney
Stanley
Woodstock
Chipman
Cape Pele
Cape Tormentine
Moncton
Moncton A
Hamtown Corner
Kingsley Road
Minto
East Canaan
Havelock
Acadia Forest Exp Stn
Mactaquac Prov Park
Fredericton CDA
Fredericton A
Wiggins Point
Coles Island
Petitcodiac
Sackville
Kingsclear
Kings Landing
Oromocto
Gagetown
Harvey Station
Sussex (2)
Alma
Hoyt
Hampton
Browns Flat
Pleasant Mountain
Pleasant Ridge
Forest Hills
Milledgeville
St John A
St John West Police Stn
Musquash
Lorneville
Red Head
Milltown
St Stephen
St Andrews
St George (2)
Pennfield
Point Lepreau
Southwest Head
Miscou Island
Caraquet
Shippegan
Bertrand
St Isidore Tower
Tracadie
PREPARED BY THE RIVER FORECAST CENTRE NBDOE
Revised September 1982

Total Precipitation (mm)
Percent of Normal
August, 1990


CLIMATOLOGICAL STATIONS
of
NEW BRUNSWICK
75
125
100
125
125
75
100
100
125
150
100

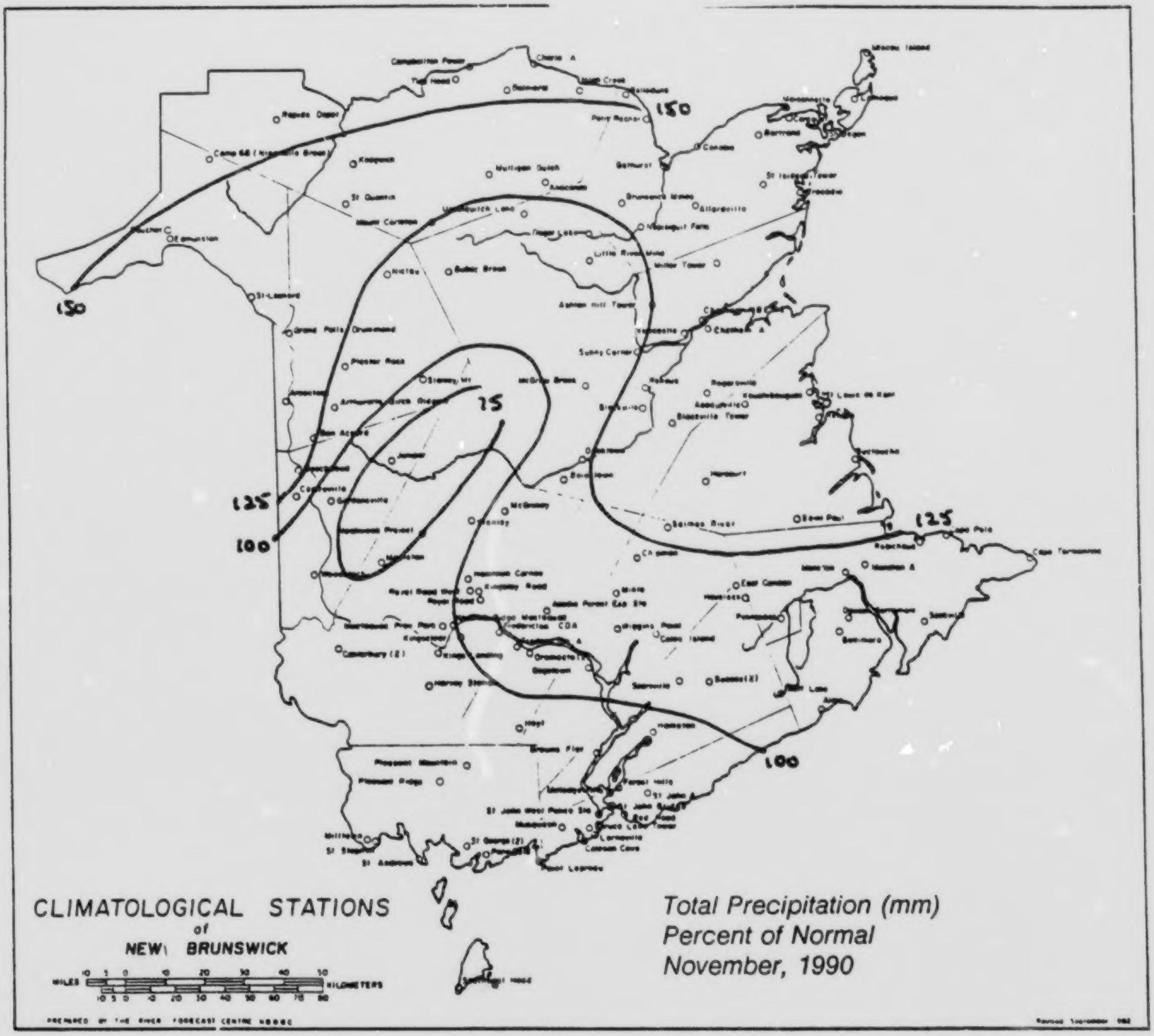
Total Precipitation (mm)
Percent of Normal
September, 1990



CLIMATOLOGICAL STATIONS
of
NEW BRUNSWICK

Total Precipitation (mm)
Percent of Normal
October, 1990

200
225
225
200
175
150
125
250
275
300
275
250
225
200
175
150
125
200
175
150
125
125
Campbellton
Dalhousie
Bathurst
Chatham
Newcastle
Moncton
Moncton A
Cape Tormentine
Cape Pele
Miscou Island
St John
Fredericton
St Stephen
St Andrews
Edmundston


150
150
125
125
100
100
75
MILES
KILOMETERS

CLIMATOLOGICAL STATIONS
of
NEW BRUNSWICK

Total Precipitation (mm)
Percent of Normal
November, 1990

FRUITS

HIGHBUSH BLUEBERRY CLONE EVALUATION

C. Murray and B. Dykeman

ABSTRACT: Six Highbush blueberry cultivars and one half-high clone are being evaluated for hardiness and adaptability at the N.B. Horticultural Centre, Hoyt. The half-high clone, NBBC1, out yielded the best highbush cultivar by 174%. Winter injury continues to be extensive among the highbush cultivars.

ÉVALUATION DE CLONES DE BLEUET GÉANT

RÉSUMÉ: Six cultivars de bleuet géant et un clone de bleuet semi-géant ont été évalués au Centre horticole provincial de Hoyt afin d'établir leur rusticité et leur capacité d'adaptation. Le rendement du clone semi-géant NBBC1 était de 174% supérieur à celui du meilleur cultivar de bleuet géant. Le gel continue de faire des dégâts importants chez les cultivars de bleuet géant.

INTRODUCTION: Any perennial fruit crop to be grown in this area must exhibit a high degree of winter-hardiness. Using this criteria, six highbush blueberry (vaccinium corymbosum) cultivars were selected for a cold-hardiness trial, along with one half-high clone (V. corymbusum x angustifolium) of known cold hardiness and high production capability.

Differential Thermal Analysis (DTA) was performed on bud and stem tissue for two years (1985-86, 86-87) to evaluate relative tissue and bud hardiness. No significant differences between clones were found.

To make the planting more uniform, all fruit buds were pruned in 1986. Harvest data was gathered in 1987 and 1988.

Some additional pruning was done in the spring of 1988 to remove diseased wood (Stem canker and witches broom) as well as winter-killed twigs.

MATERIALS AND METHODS: The seven cultivars were planted in a RCBD, with six plants per replications and four replications. Spacing was 1 m x 2 m. The plants are fertilized with 50 kg/ha N, $P_2 0_0 5$ and $K_2 0$ in the spring and irrigated as necessary.

RESULTS AND DISCUSSION: Harvest yields were increased over the 1987 season, and the gap between NBBC1 and the highbush cultivars has narrowed. (Falling from 325% greater yield in 1987 to 174% in 1988). Five harvests were made from August 4 to September 1. Average 100 berry weight increased from 1987 (See Table 1).

Winter injury was fairly extensive in 1987-88. Many of the flower buds were lost on the hardier cultivars as well as extensive tip dieback on the more tender cultivars.

TABLE 1: PERFORMANCE OF HIGHBUSH BLUEBERRY CULTIVARS 1990

Cultivar	Total Yield (g/plot)	100 Berry Wt. (g)	Projected Yield (kg/ha)
NBBC1	2449	110.9	2033
Northland	1902	144.1	1579
Patriot	2169	263.4	1799
Burlington	383	143.4	318
Blueray	256	211.8	213
Bluecrop	132	218.6	110
Spartan	476	272.4	395

TABLE 2. A comparison of projected yields over the last four years.

Cultivar	1987 Projected Yield (kg/ha)	1988 Projected Yield (Kg/ha)	1989 Projected Yield (kg/ha)	1990 Projected Yield (kg/ha)
NBBC1	5338	8673	786	2033
Northland	1689	4974	903	1579
Patriot	946	4091	632	1799
Burlington	334	2629	39	318
Blueray	966	1257	47	213
Bluecrop	213	1124	28	110
Spartan	162	906	14	395

CULTURE DE CANNEBERGES SUR TOURBIÈRES ÉPUISÉES

Serge Michaud et Gaetan Chiasson

RÉSUMÉ: Une étude a été entreprise en 1990 afin d'évaluer l'établissement de cinq différentes variétés de canneberges sur une tourbière située à Pokesudie, N.B. Quoique plusieurs problèmes aient été rencontrés au moment de la plantation, l'enracinement des boutures a été satisfaisant. Toutefois, il faudra porter plus d'attention au programme de fertilité l'an prochain.

FIELD ESTABLISHMENT OF CRANBERRIES ON DEPLETED PEAT BOGS

ABSTRACT: A study was initiated in 1990 to evaluate the establishment of five different cranberry varieties on a depleted peat bog in Pokesudie, N.B. While various problems were encountered at planting time, rooting of the cuttings was good, more attention will have to be given to the fertility in the coming year.

INTRODUCTION: La culture des canneberges semble générer de plus en plus d'intérêt au Nouveau-Brunswick. Les propriétaires de tourbières cherchent une alternative pour ces dernières une fois qu'elles sont épuisées. Puisque les canneberges y poussent à l'état sauvage, plusieurs se sont demandés si l'établissement de canneberges serait possible. Afin de faire une meilleure évaluation des sites, un consultant de la Colombie-Britanique, M. Paul Dhillon, fut invité à l'été 1989 à visiter les différentes tourbières de la région. Selon lui, les tourbières se prêteraient à la culture de la canneberge.

Présentement, il existe deux opérations commerciales de canneberges,soit à St. Louis de Kent et à Oromocto. Les deux opérations sont toutefois sur sol minéral. Afin d'évaluer le potentiel de différentes variétés sur sol organique, il fut décidé d'établir un essai sur une tourbière épuisée.

MATÉRIAUX ET MÉTHODES: L'essai fut établi sur une tourbière épuisée propriété de Lamèque Quality Group et située à Pokesudie. Cinq lits d'une superficie de 0,2 ha chacun furent préparés afin de recevoir les cinq variétés suivantes: Stevens, Ben Lear, Crowley, Bergman et Pilgrim. Les vignes provenaient de la Colombie-Britanique. Arrivées à Moncton par avion au mois d'avril, elles furent entreposées dans un entrepôt frigorifique jusqu'au moment de la transplantation, du 29 mai au 1er juin.

La mise en terre fut effectuée à la main en étendant les vignes sur la tourbe. Une herse à disque tirée par un cheval fut d'abord utilisée pour enfouir les plants. Cette technique fonctionnant plus ou moins bien, on construit un rouleau pour enfouir ces vignes. Un système d'irrigation fut installé immédiatement et les vignes irriguées au besoin.

Une fois les vignes enracinées, on a appliquée des engrais. La première application fut effectuée le 17 août au taux de 100kg/ha de 10-25-15 suivi de 100 kg/ha de 4-25-35 le 1er septembre. Une autre application de 200 kg/ha de 0-0-60 fut effectuée à la fin septembre afin de préparer les vignes pour l'hiver.

On doit noter que les lits ne sont pas entourés de digues. Il est donc impossible d'inonder ces dernières pour l'hiver. On a donc installé des clôtures à neige afin d'atténuer l'effet du vent et encourager la couverture de neige à rester sur les vignes.

OBSERVATIONS: Le pourcentage d'enracinement des vignes a été plus faible que prévu. Ceci peut être dû à deux facteurs. Premièrement, les lits ont été préparés au printemps, ce qui a résulté en une surface de tourbe très volage et peu compactée. Par conséquent, la tourbe n'était pas toujours humide et plusieurs poches d'air étaient présentes. Deuxièmement, l'utilisation du cheval a résulté en plusieurs vignes enfouies trop creux dans la tourbe et en une surface plus ou moins uniforme. Les dépressions étaient souvent trop humides alors que les surfaces plus élevées séchaient trop rapidement.

Des cinq variétés, Stevens est celle qui est habituellement considérée comme la plus résistante et la plus prolifique. Dans cet essai, c'est la variété qui s'est établie le moins rapidement. Ceci a pu être causé par l'entreposage prolongé. Les vignes ont également manqué d'engrais tôt en saison. La première application aurait du avoir lieu deux semaines plus tôt, mais des problèmes d'approvisionnement et les conditions de température ont retardé le tout.

Néanmoins, les vignes avaient bonne allure à la fin octobre et il est espéré qu'elles survivront à l'hiver.

CONCLUSION: Deux constatations sont déjà possible. Les lits doivent être préparés l'année précédant la plantation afin d'avoir une suface unie et ferme pour y placer les vignes. De plus, un rouleau auto-propulsé devra être construit afin d'enfouir les vignes d'une façon convenable.

L'essai se poursuivra en 1991 afin de mesurer le pourcentage de survie des vignes et évaluer le développement des différentes variétés.

COMMERCIAL FEASIBILITY OF RED CURRANTS

R. Tremblay, J. Baker

ABSTRACT: This was the final year for a plantation of Red Currants at the N.B. Horticultural Centre, Hoyt, N.B. Yield evaluations increased for the last two years on this five year study. In 1989 there was a 494% increase in yield and in 1990 a 44% increase.

POSSIBILITÉS COMMERCIALES DU GADELLIER ROUGE

Résumé: Nous en somme à la dernière année de culture du gadellier rouge au Centre d'horticulture de Hoyt (N.-B.). Le rendement a augmenté au cours des deux dernières années de cette étude quinquennale. La hausse de rendement a été de 494 p. 100 en 1989 et de 44 p. 100 en 1990.

INTRODUCTION: Currants are a member of the Ribies species and the fruit is a true berry. Red currants have a high yield potential and are well suited to our local climatic conditions. This bush type fruit is easy to grow and hardy enough for many soils in N.B. although they prefer a well-drained rich clay loam. They are self - fruitful and do not need pollination from another cultivar to produce good fruits. Plantations of currants usually remain productive for at least 10 years. Red Currants fruit at the base of 1 - year old wood and more so on spurs of 2 and 3 year old wood. Older wood produces inferior fruit. The object of pruning is to remove wood older than three years so that it will be replaced by a number of younger shoots. Currants are known for their distinctive flavour and can be used in juice, jam, jelly and wine-making. There is a small demand for red currants on farms specializing in pick-your-own fruit. This trial was established to evaluate the commercial feasibility red currants based on yield results for five years.

MATERIALS AND METHODS: The red currant cultivar Von Tets (Jonkheer van Tets) was planted in 1985 in a Riverbank sandy loam. The spacing was set at 2 meters between rows and 1 meter on the row. Chemical controls for the five year period were:
1985-1988: Every week from June 15 - September 5, Thiodan 1 l/ha). Every two weeks for the same period, Captan (2kg/ha) or Benlate (0.5 g/ha).
1990: Thiodan was applied on June 10 and June 15. Captan was applied on June 30 only. Fertilizer applications were: 1985 at planting- 15-15-15 at 600kg/ha; 1987-1989 -5-15-15 at 500 kg/ha.
The currants were not pruned over the five year period. The berries were harvested into plastic flats and weighed as kg/bush. This amount was then calculated into kg/ha.

RESULTS: See Table 1 for the yield of the red currant Von Tets from 1985 - 1990. Harvest dates ranged from June 4 in 1989 to June 10, 1990. Harvesting times ranged from one day in 1985 to five days in 1989 and 1990. The currants will stay on the bushes for at least a month. There was a 494 % increase in yield from 1988 - 1989 and a 44 % increase in yield from 1989 - 1990. The yield variations during this five year study could be attributed to:

1) wind damage - red currant shouts grow vigorously in the spring and can be smashed by wind before they are lignified.
2) lack of water - This plantation was not irrigated except at planting.
3) Lack of pollination by wind and insects.
4) Pruning techniques: Age of the plants - Red currants are slow to come into full crop.

The currant sawfly, and currant aphid populations were detected in 1987,1988. The currant aphid did some serious damage on the leaves in 1987. They were controlled with Thiodan. The only disease problem, powdery mildew was controlled each season with either Captan or Benlate.

DISCUSSION: An average yield for red currants is 5080 kg/ha and a good yield is @ 10,160 kg/ha. (MAFF\ADAS) Using these values as standards it could be said that the plantation was well below average for the first three years. However harvests in 1989 and 1990 were well above average. In order for any plantation of red currants to be economically feasible the grower must ensure there is a consumer market, either as a pick-your own operation or as wholesale. A dollar return under optimal growing conditions will not be realized for three - five years from planting, but once yields are productive the plantation can last as long as fifteen years.

Table # 1

YEAR	**kg/40 bushes**	**kg/ha**
1986	9.48	1185
1987	23.77	2971
1988	19.50	2437
1989	116	14500
1990	116 kg/28 bushes	20828

REFERENCES: Ministry of Agriculture, Fisheries and Food. ADAS. Bush Fruits. Reference Book 4. June 1976. pp 97-103.

E. N. Estabrooks. Growing Currants And Gooseberries in New Brunswick. Factsheet No. 83-002. March 1983.

Tremblay, R., B.W. Dykeman 1987. Commercial Feasibility of Red Currants. Adaptive Research Report. N.B.D.A Vol. 9, 18.

Tremblay, R., B.W. Dykeman 1988. Commercial Feasibility of Red Currants. Adaptive Research Report. N.B.D.A Vol. 10, 16.

Raspberry Variety Trial

R. Tremblay, J. Baker

ABSTRACT: A trial involving eight raspberry cultivar was established in 1984 at the Horticultural Centre in Hoyt, New Brunswick. The objective of this trial was to evaluate their production performance, resitance to harsh temperatures and reactions to conventional cultural methods. Production performance (yield results) for 1989 and 1990 and winter injury evaluations (for 1989 only) are summarized in this paper. The yields are poor for all cultivars.

ESSAI DE VARIÉTÉS DE FRAMBOISIERS

Résumé: Un essai portant sur huit cultivars de framboisiers a été mis sur pied en 1984 au Centre d'horticulture de Hoyt (Nouveau-Brunswick), afin d'évaluer le rendement, la résistance à des températures extrêmes et la réaction des cultivars à des façons culturales conventionnelles. Les rendements pour 1989 et 1990 et les dommages causés par l'hiver (pour 1989 seulement) sont résumés dans le présent rapport. Les rendements sont faibles pour tous les cultivars.

METHODS AND MATERIALS: The varieties being evaluated are: Gatineau, Heritage, Nova, Boyne, Festival, Comet, U.S. Latham and K65-12. The trial was set up in a 60 meter x 30 m randomized block design with four replications and eight treatments (cultivars). Plant spacing was 60 cm in 1984.
In sprig **1988** the plants were cut down to ground level, therefore yields were not evaluated until 1989. An application of 300 lbs of 15-15-15 was done in the spring. At the end of June the raspberry canes were 50-60 cm high. On June 27, the fertilizer 20-20-20 (Plant Product) was applied as a foliar spray.
Cultural and chemical controls for **1989** were; Foliar spray application of boron (solubor) due to a boron deficiency detected through leaf analysis (1987) and 300 lbs/acre of 15-15-15 in the spring. The harvesting period extended from July 12 to August 11, 1989, every two to three days. (July 13 to August 6, 1987). The Heritage was pruned on May 12, 1989 at the same time as the ties for winter protection were removed. The old fruiting canes were removed after harvest. On November 20 the canes were tied together for the winter.
On May 12, **1990**, the ties were removed and all plants were pruned to 4 ft and fertilized with 330 lbs/acre of 15-15-15. The harvesting period extended from July 16 to August 10, 1990. The old fruiting canes were removed after harvest and the canes were tied in late fall.
Every year the soil is rototilled between the rows (root damage is probably affecting the canes performance since raspberry roots are close to the surface.
There was no fertilizing or spraying done in 1990.

RESULTS: The eight cultivars were evaluated in terms of their resitance to harsh temperatures by the following observations made on June 13, 1989. The varieties are listed in order of the variety least affected by winter conditions to the most affected by winter conditions.

OBSERVATIONS AND ORDER:

Festival	4-5 ft tall, healthy plants. few damaged tips* many flower buds
Heritage	healthy, many flower buds
Boyne	10-15 % damaged tips some late breaking buds** some leaf edges burned (perhaps due to boron foliar spray)
U.S. Latham	10-20% dead tips, otherwise the plants look healthy some late breaking buds many flower buds
K65-12	20-70% damaged tips many late breaking buds new growth starting at the base of the plant some flower bud development
Comet	20-80% damaged tips in different blocks average of about 40% damage many late breaking buds some flower buds in all plots some late breaking buds
Gatineau	average of about 50% damaged tips many late breaking buds new growth starting at the base of the plant few flower buds
Nova	no information available

* **Damaged tips** - indicates the top 20-25 cm of the cane is severely damaged.

** **Late breaking buds** - describes buds that were just beginning to break, they had very small leaves and in some cases these leaves appeared not to survive for very long.

1988: It was the second time since the 1984 that the whole plantation was cut down to ground level. It doesn't seem to help at all to increase yields in the following year.

YIELD RESULTS 1989: No fall harvesting of Nova (most falls the fruits will not develop to full maturity. The top of the cane where these fruit grow will die over the winter) and Heritage were never done in the fall for any year.

The cultivar **Boyne** had not a significantly higher yield than Nova, Festival, and U.S. Latham, however, was significantly higher than Gatineau, Heritage, Comet, and K65-12. See table # 1.

YIELD RESULTS 1990: The cultivar **Gatineau** had not a significantly higher yield than Boyne, Festival, Nova, and U.S. Latham, but was higher than Heritage, K65-12, and Comet. See table # 1.
YIELD RESULTS TWO YEAR AVERAGE: The cultivar **Boyne** had not a significantly higher yield than Nova, Festival, Gatineau, and U.S. Latham, but was higher than Heritage, Comet, and K65-12. See table # 1.

TABLE 1

RASPBERRY CULTIVAR YIELDS IN KG PER HA						
	1989		1990		89-90	
BOYNE	1398	A***	1356	A	1377	A
NOVA	1032	AB	1266	A	1150	A
FESTIVAL	954	ABC	1296	A	1127	A
GATINEAU	805	BC	1377	A	1093	A
U.S. LATHAM	903	ABC	1250	A	1076	A
HERITAGE	530	BCD	706	B	618	B
COMET	417	CD	486	B	451	B
K65-12	255	D	512	B	382	B
*** Duncan's Multiple Range Test at alpha = .05						

DISCUSSION: To grow a good crop of raspberries you need a soil with a good organic matter content. The Riverbank sandy loam that this trial is growing in is very low in organic matter. This is one of the reason for a poor yield that should be up by 169% (1.5 imp. ton/acre; 3764 kg/ha). Future reports will deal with fruit size comparisons.

REFERENCES: Tremblay, R., B.W. Dykeman, 1987. Essai de variétés de framboises. Rapport de recherche sur l'adaptation, Agriculture Nouveau - Brunswick. Vol 9,16.

Tremblay, R., B.W. Dykeman, 1986. Essai de variétés de framboises. Rapport de recherche sur l'adaptation, Agriculture Nouveau - Brunswick. Vol 8, 20.

Tremblay, R., B.W. Dykeman, 1985. Essai de variétés de framboises. Rapport de recherche sur l'adaptation, Agriculture Nouveau - Brunswick. Vol 7, 38.

Tremblay, R., B.W. Dykeman, 1984. Essai de variétés de framboises. Rapport de recherche sur l'adaptation, Agriculture Nouveau - Brunswick. Vol 6, 32.

FUNGICIDE EVALUATION OF SPUR BLIGHT CONTROL IN RED RASPBERRIES

R. Tremblay, K, Lynch, J. Baker

ABSTRACT: An efficacy trial was established to compare Bordeaux spray(copper sulphate + lime) with fungicides currently registered for Spur Blight (Didymella applanata) on Red Raspberries. Efficacy data was not collected as the trial did not develop Spur Blight. Lab analysis did indicate that copper levels on both leaf and berry samples were significantly higher on those plots treated with Bordeaux, than the untreated (control) plots.

ÉVALUATION DE FONGICIDES CONTRE LA BRÛLURE DES DARDS DANS LE FRAMBOISIER ROUGE

Résumé: Un essai a été réalisé pour comparer l'efficacité des pulvérisations de Bordeaux (sulfate de cuivre + chaux) et des fongicides actuellement homologués contre la brûlure des dards (**Didymella applanata**) sur les framboisiers rouges. On n'a pu vérifier l'efficacité de ces traitements parce que les framboisiers n'ont pas été touchés par la brûlure des dards durant l'essai. Une analyse en laboratoire a indiqué que les taux de cuivre sur les échantillons de feuilles et de fruits étaient considérablement plus élevés dans les parcelles traitées avec le Bordeaux que dans les parcelles témoins non traitées.

INTRODUCTION: Spur blight, caused by the fungus Didymella applanata, is a common disease of red raspberries. It affects the buds(spurs) which produce next years fruiting laterals. At present two chemical controls are registered for spur blight on red raspberries. They are, Elgetol 195 SN and Ferbam 76WP. The purpose of this trial was to compare the efficacy of Bordeaux spray with these fungicides and to collect information in support of a Minor Crop Registration. The trial was carried out on a commercial raspberry farm near Fredericton.

METHODS AND MATERIALS: A four row section of a commercial planting was divided into a randomized complete block design with five treatments and four replications. Sprays were applied with a back pack CO2 sprayer at 552 kPa and a spray volume of 7.5 litres per 10 meters of row. On August 3, berry samples (500g each) were harvested from the Bordeaux and untreated sections. On August 9, 75 leaves were collected from the Bordeaux and untreated sections. Copper residue levels were calculated in ppm. The laboratory procedure for these levels are: For berries the dry matter percentage is calculated from the unwashed sample (500g)[1]. This dry matter sample is then used to calculate (in ppm) copper residue.

For leaf analysis, the dry matter from 75 leaves is used to calculate (in ppm) the copper content. Materials applied were: Lime Sulphur (sulphite sulphur 29%) 1:9 dilution; Bordeaux 10:10:100 (100g hydrated lime + 100g copper sulphate + 10 litres water)[2]; Elgetol (3.75 litre + 35 litres water) 1:10:3 dilution; Ferbam 76WP 2g/litre.

SPRAY RECORDS:

FIRST SPRAY DATE: MAY 3 & 4
BORDEAUX,CAPTAN,SULPHUR,ELGETOL.
SECOND SPRAY DATE: JUNE 14: SECOND APPLICATION OF BORDEAUX, FIRST APPLICATION OF FERBAM.
THIRD SPRAY DATE: JULY 10: THIRD APPLICATION OF BORDEAUX.
FOURTH SPRAY DATE: SEPTEMBER 4: FOURTH APPLICATION OF BORDEAUX, SECOND APPLICATION OF FERBAM.

RESULTS AND DISCUSSION: No spur blight developed in the trial and therefore no statements can be made regarding fungicide efficacy. Copper levels in Bordeaux treatments increased by more than 700 percent in raspberry leaves(Table #2), Normal copper levels for leaves was, between 2-50 ppm. One other source(Stang,1985), reports that a high level would be a reading greater than 45 ppm. Copper levels in the fruit also increased significantly however there were large differences between replications indicating a possible mixing problem(Table #1).

CONCLUSION: The absence of Spur Blight meant no data was collected nor any information in support of a Minor Crop Registration of Bordeaux. Significant results were; the high copper levels of leaves in the Bordeaux plots and the fact that copper sulphate and lime do not mix well which results in uneven spray coverage.

ACKNOWLEDGEMENTS: Thanks are extended to Dave McKinney for providing raspberry plots for this trial.

TABLE #1: TISSUE ANALYSIS FOR WHOLE BERRIES

REP & TREATMENT	DRY MATTER CONTENT %	COPPER LEVELS OF DRY MATTER IN PPM.
1 Bordeaux	14.00	196
1 Untreated	14.00	26
2 Bordeaux	14.00	13
2 Untreated	13.00	14
3 Bordeaux	13.00	15
3 Untreated	13.00	22
4 Bordeaux	13.00	138
4 Bordeaux	14.00	19
AVERAGE	BORDEAUX =14 UNTREATED=13	BORDEAUX = 76 UNTREATED =21

TABLE #2 TISSUE ANALYSIS FOR RASPBERRY LEAVES

REP #	TREATMENT	DRY MATTER (PPM)
REP 1	BORDEAUX	396
1	UNTREATED	33
REP 2	BORDEAUX	246
2	UNTREATED	40
REP 3	BORDEAUX	513
3	UNTREATED	98
REP 4	BORDEAUX	277
4	UNTREATED	7
AVERAGE		UNTREATED = 44.5 BORDEAUX = 358

1 Dry matter = (weight of sample after drying) X 100
% (weight of sample before drying)

2 The copper sulphate and lime were sifted through the cheesecloth separately. The lime was added after the copper and not until the tank was one-half full. A pressurized nozzle was used to screen the products into the container. The products were mixed vigorously and applied to the crop immediately.

REFERENCES: P.N.W Bulletin Publication 176, Wash. Oregon and Idaho.

Stang J. January 1985. Foliar Analysis For Raspberries And Strawberries. Proceedings For The New England Small Fruit School.

Health and Welfare Canada, Health Protection Branch. Poisonous Substances In Food. Ottawa 1970. Section B 15.002 Food and Drug Regulations

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1990 INTEGRATED PEST MANAGEMENT PROGRAM IN STRAWBERRIES: PRELIMINARY REPORT

J. Baker, R, Tremblay

ABSTRACT: A Integrated Pest Management Program was initiated this year in order to identify pest and management problems facing New Brunswick strawberry growers. Some of these problems include; the strawberry clipper weevil, two - spotted spider mites, tarnished plant bug, red stele, and multiplier. Positive outcomes were; grower education in pest, disease and weed identification.

PROGRAMME INTÉGRÉ DE LUTTE ANTIPARASITAIRE EN 1990 DANS LES FRAISERAIES: RAPPORT PRÉLIMINAIRE

Résumé: Un programme intégré de lutte antiparasitaire a été lancé cette année en vue de définir les problèmes de gestion et de lutte antiparasitaire rencontrés par les producteurs de fraises du Nouveau-Brunswick. Parmi les insectes nuisibles visés, mentionnons l'anthonome du fraisier, le tétranyque à deux points, la punaise terne, le stèle rouge et le multiplicateur. Le programme a eu pour effet positif de renseigner les producteurs sur les ravageurs, les maladies et l'identification des mauvaises herbes.

INTRODUCTION: The main goal of this program was to identify the major problems facing N.B. strawberry growers as part of a trial Integrated Pest Management Program. The goals and objectives were carried out by the N. B. Agriculture scout and the cooperation and expertise of agricultural specialists. The main objectives were as follows:

1 The evaluation of field techniques in determining pest threshold levels.
2 To educate strawberry growers on; identification of weeds, insects and diseases, the proper selection of pesticides, safe use of pesticides and field techniques used to determine pest threshold levels.
3 To identify positive and negative aspects of a scouting program and develop viable alternatives for a more successful program in 1991.

DESCRIPTION OF PROCEDURE: Nine strawberry farms, covering approximately 67 acres or 27 hectares were selected at various locations in order to represent the entire province. The farms were scouted every 2-3 weeks from May through October. Seasonal scouting procedures were as follows:

MAY:
A farm map indicating, location of fields, cultivars and field size. Soil samples were taken to determine a) mechanical analysis for each field and b) field organic

matter content c) soil pH. Mechanical analysis is particularly important in the recommendation of herbicides.

A pesticide questionnaire was distributed to the growers to determine which pesticides are being applied and also the methods of application.
JUNE: A leaf evaluation to test for two-spotted mites in each field. It was determined that at 50 mites per leaf we would stop counting and recommend an insecticide. However this should not be interpreted as a threshold level. Strawberry clipper weevil evaluation.
JULY: Tissue analysis. Fruit rot evaluation on 1 metre sections done during harvest. Berry analysis to check for slug damage and fruit rot disease. Lab analysis of unhealthy plants.
AUGUST: Soil test for all fields after renovation to test for nutrient levels so fertilizer recommendations can be made. Leaf analysis three weeks after renovation.
SEPTEMBER: Collected 50 petiole samples from each field to check for cyclamen mite. Collected plant samples for lab analysis - root diseases and root pest problems.
OCTOBER: Operation Spray Check - calibrated sprayers with the growers.

MAJOR PROBLEMS IDENTIFIED:

PESTS; strawberry clipper weevil, two-spotted mite, tarnished plant bug, nematodes, leaf roller, slugs.

DISEASES; red stele, multiplier, fruit rot, and green petal.

WEED PROBLEMS; high density of different weed species

MANAGEMENT PROBLEMS; A lack of knowledge in weed identification and selection of the proper herbicides, a lack of knowledge of plant pests and disease problems and their treatments, unsafe practises regarding the application of chemical sprays, limited knowledge in the calibration of chemical sprayers.

FIELD TECHNIQUES USED TO IDENTIFY PESTS AND DISEASES:

STRAWBERRY CLIPPER WEEVIL: A one meter section was used to determine the ratio of damaged to healthy flower buds. A high number of damaged buds indicated significant weevil injury.

TWO-SPOTTED MITES: Twenty leaves were collected from each of the four outside corners of the field and from the middle, a total of 100 leaves per field. The leaves were then put through and automatic roller and two-spotted mites were collected on a grid and counted under a microscope.

FRUIT ROT ANALYSIS: One meter sections were harvested to evaluate the percent of fruit rot. This was done at one picking date on each farm.

LAB ANALYSIS PROCEDURES:
LEAF ANALYSIS: In each field 100 petiole and leaf samples were taken in random fashion. These were analyzed for nutrient content of the major elements. The same leaf samples were also taken for lab analysis of pests and diseases, (first step).

SOIL ANALYSIS: Soil taken for analysis was collected with a soil probe in at least 15 different sites per field. Mechanical analysis (provides a breakdown of the fraction, given in percentage of sand, silt and clay present per soil sample) organic matter content, (analysis of phosphate, potash, calcium and magnesium) and pH were determined for each field.

WATER ANALYSIS: A water sample was taken from each farm from all sources used in the application of pesticides. The samples were tested for pH levels.

PROGRAM EVALUATION: Most importantly this program was able to achieve the intended goal of identifying the major problems in N.B. strawberry fields. As well the growers became more knowledgeable in weed identification, sprayer calibration, safe pesticide application and field techniques used to identify pests and calculate thresholds.
In order for this program to be offered as a (paid) service to growers the following changes should be made:

- The number of farms should be reduced to a number that allows the scout to make weekly farm visits. The goal is to identify and prevent problems.
- A farm map, with all cultivar names and field names is essential before any scouting begins.
- Mechanical analysis of soil is a lengthy lab procedure. Therefore, all fields should be sampled in spring as the soil texture determines the rates

of application of many herbicides at the time of renovation or later.

- Each scouting visit should have a specific purpose designed for a particular time in the growing season. For example one of the first pests to attack strawberries is the strawberry clipper weevil in May, therefore this should be the only pest problem scouted on that visit. This allows for an organized problem solving approach, in early summer and again in early fall.
- The weed specialist should visit the farm once in early summer and early fall with the scout and identify five weeds (per field) in high density. Five weeds per field was chosen because rarely are there more weed species in densities high enough to warrant application of herbicides. This inventory was used to recommend herbicides and the proper rates.
- A system should be established to guarantee that the results of the scouting are reported to the participating growers as soon as possible in order to be useful.
- Finally, the sprayers should be calibrated in the spring of each year in order to reduce the amount of pesticide sprayed by ensuring the machinery is operating at maximum efficiency.

CONCLUSION: Overall the program was a success, as a trial Integrated Pest Management Program. Much of the value derived from I.P.M programs are subjective ie, better yields through pest identification and difficult to measure. However these must be weighted into any cost analysis of an I.P.M. program in determining it's feasibility. In theory it is difficult to justify the cost of fuel used in weekly visits when I.P.M programs are conservative in their approach. On the practical side it is difficult to determine whether the costs ie; fuel and salary equals the savings(dollars) to the grower from reduced pesticide use. Perhaps an alternative to I.P.M. in N.B. would be the use of a videocassette on scouting techniques, in association with a scouting manual which could be distributed to the growers. This would eliminate the cost of fuel to the farms and provide the grower with the information necessary to practise Integrated Pest Management. These could be made available through the regional agrologists. Such a service would be attractive to farmers if they were certified or credited with reduced pesticide labels.

Acknowledgements: Thanks are extended by the authors to Kelvin Lynch, Kevin McCully and David Finnamore for their input throughout the growing season and to Marc Savoie, summer student. Thanks also to the participating growers for their patience.

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EFFECT OF WINDBREAKS ON STRAWBERRY PRODUCTION

R. Tremblay, G. Read, J. Baker

ABSTRACT: A trial was established at two locations in N.B., to test the effect of artificial windbreaks on strawberry yields. Fruit weight results 3 weeks after establishing the windbreak at Site #1 were not significantly different. On Site # 2, 40% more runners were produced in the windbreak area. Anemometer readings at Site # 1 indicated little reductions in wind speed throughout the summer months. At Site # 2 anemometer readings indicated a higher wind speed in the non-windbreak section.

EFFET DE BRISE-VENT SUR LA PRODUCTION DE FRAISES

Résumé: Un essai a été réalisé à deux endroits du Nouveau-Brunswick pour vérifier l'effet de brise-vent artificiel sur le rendement des fraisiers. Le poids des fruits n'avait pas beaucoup varié au premier endroit trois semaines après l'installation du brise-vent, mais l'on avait constaté une augmentation de 40 p. 100 des stolons au deuxième endroit. Les lectures d'anémomètres n'ont pas indiqué beaucoup de réduction de la vélocité du vent au premier endroit pendant tout l'été, tandis que l'on constatait une plus grande vélocité du vent dans la section non protégée par un brise-vent au deuxième endroit.

INTRODUCTION: Trials with artificial windbreaks on apple trees and some vegetable crops in New Brunswick have proven to be successful. In light of this, artificial windbreaks were installed in strawberry fields as a means of reducing wind speed in order to improve pollination, decrease plant damage and possibly improve moisture balance.

MATERIALS AND METHODS: Two strawberry fields, one near a lake (site 1) and one in an open area (site 2), were chosen as presumably windy locations. Site #1 was planted in 1989, Site #2 was planted on June 6, 1990. The cultivar Veestar was grown at both sites. The windbreaks were constructed along the strawberry rows. At Site # 1 the windbreak was constructed on May 29,1990 at 10% bloom and on June 28 at Site #2. One row in a field was divided into six sections; 3 Windbreak and 3 Open containing 3 replicated 2 m sections. The windbreak fabric (figure 2) was a woven black polypropylene (long life), six feet high with 50% porosity. This was secured onto 4x4 posts as illustrated in figure 1. The posts were secured on wooden bases 12" underground with rocks and soil. Two totalizing anemometers, measuring wind velocity, were installed at each site, one in an open section and one in a windbreak section. Anemometer readings were recorded at Site #1 from July 10 to November 21,1990 and at Site #2 from October 9 to November 21,1990. On Site # 1 berries were harvested six times between, June 28 and July 12. Site # 2 will be harvested in 1991.

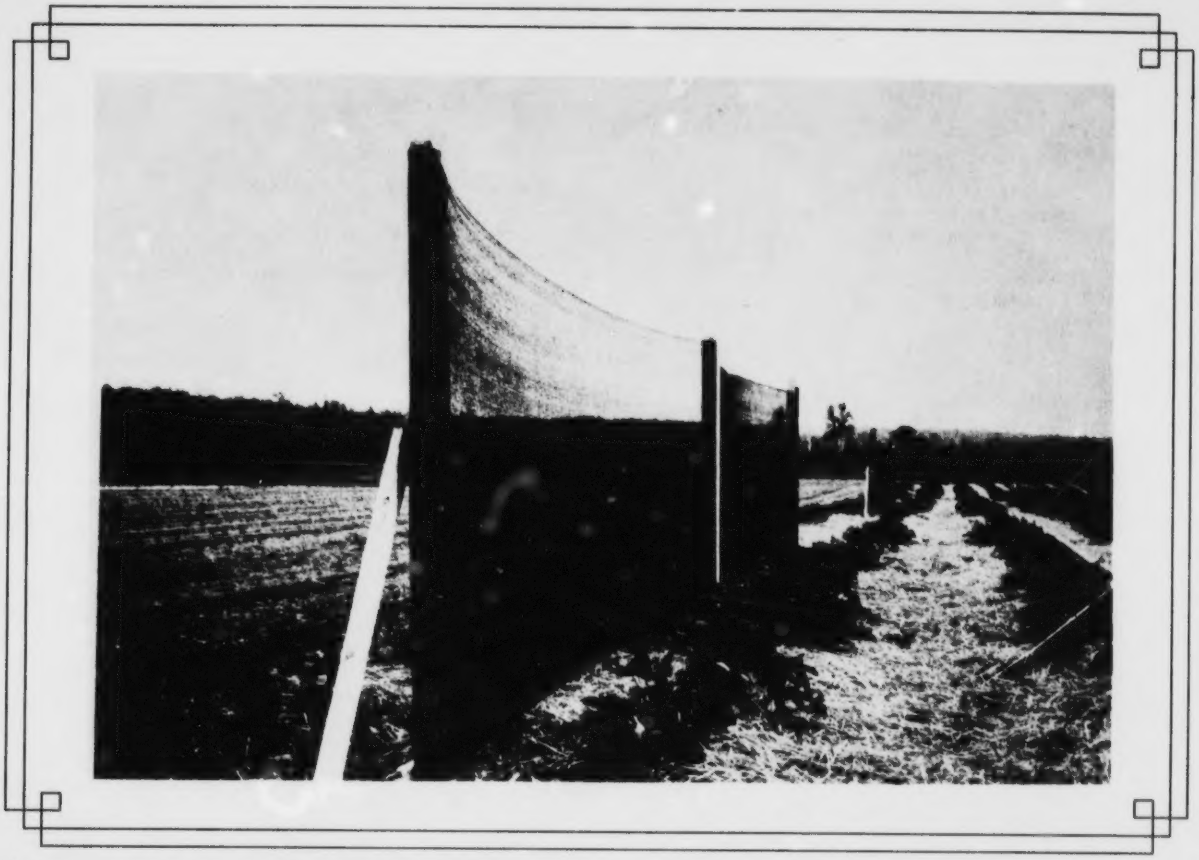

Figure 1 Windbreak at site # 2.

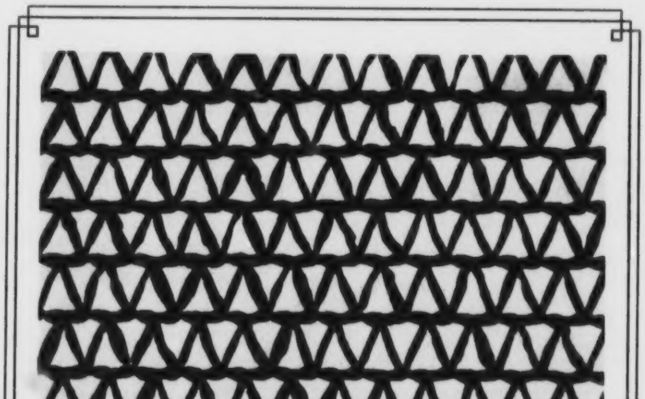

Figure 2 Close up of windbreak material (polypropylene)

RESULTS AND DISCUSSION: Fruit weight results at Site #1 were not significantly different. At Site #2 there was a highly significant difference in runner counts between windbreak and non-windbreak sections, at the 0.02 level (ANOVA). There were 40% more runners in the windbreak sections.

Anemometer readings were taken to compare differences between windbreak and open sections, at each site. On site 1 for a 50 day period wind speed in the windbreak section was 3.67 km/hr

compared to 3.86 km/hr in the open section. On site 2 for a 43 day period the wind speed in the windbreak section was 4.88 km/hr and 7.16 km/hr in the open section. It is possible that the wind direction at Site # 1 did not blow in from the lake at all times as anticipated. It's also possible that if the wind were coming from another direction as the anemometer readings indicated, that natural windbreaks surrounding the field may have influenced the wind speed.

In 1991 both sites will be harvested.

The windbreaks were left installed in the fields over the winter. They might trap more snow, therefore possibly reducing winter injury.

CONCLUSION: The windbreak trial at Roy Pope Jr's (Site #2) gave us the most promising results with a 40% increase in rooted runners in the windbreak area. We anticipate having higher yield in the windbreak area in 1991. In order to understand what has happened at Burtis McLean's (Site #1) it may be helpful to install a wind direction device. The establishment of the windbreak at Site # 1 provided only 21 days of protection prior to harvest which may not have been sufficient for an effect. The fence was in place at full bloom however, suggesting pollination differences in this test year were not a factor.

Acknowledgements: Thanks are extended by the authors to:

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1990 SUMMARY REPORTS OF SEVEN SMALL FRUIT CROP TRIALS IN NEW BRUNSWICK

R. Tremblay, J. Baker.

FEASIBILITY OF GROWING DESERT GRAPES IN NEW BRUNSWICK CLIMATIC CONDITIONS: This trial is now in it's fifth year with 14 cultivars being grown to compare productivity and winter survival. Cultural and chemical controls included: fertilizer 15-15-15 was applied in granular form ; the stems were pruned to 6 branches with 2 buds per branch. Refractometer (indicator of sugar content) readings done on September 5, 1989 recorded readings of: "Sovereign Coronation" (16.7), "Michurinetz" (13.7),"Riparia"(13.7) "Valiant"(12.7), "Minn 78"(12.7), "5231"(11.3), "St. croix"(11), "Fredonia "(7.5) and "Minn 81"(5). When assessed for plant vigour it was found that 80% of the cultivars showed moderate-severe winter injury. The worst damage was exhibited by, "Valiant" and "Severnji". The least winter injury was exhibited by, "Fortin", "Stueban" and "Beta". Results from the first annual Grape Cultivar Taste Test saw "Minn 78" as 33% sweeter than "Sovereign Coronation". Both of these cultivars displayed an abundant supply of ripe fruit. Smaller fruits were found on ;" Beta", "Stueban", "Minn 81", "Eona" and" "Fortin". The cultivars with no fruits were; "Valiant", "Fredonia" and "Severnji". Each cultivar with berries was distinct with regard to both flavour and fruit texture. The majority of cultivars were thick-skinned and sour. No summer pruning was done in 1990. This resulted in too much foliage since the grapes were fertilized in the spring for the first time.

HARDY KIWI TRELLIS TRIAL: Nine hardy kiwi (Actinidia arguta) clones were planted May 30, 1989 on the trellis system to compare plant hardiness. Cultural and chemical controls included; fertilizer 20-20-20 at the rate of 1 tbsp/gallon of water; and hand weeding. In October 1990 the plants were evaluated in terms of vigour and winter survival. These results are illustrated in table # 1. Of the 30 kiwi's planted in 1989 13 have died leaving 17 growing plants. A fall inspection of the roots found that the dead kiwi plants had healthy root systems and no disease problems. All dead plants were removed and will be replaced in the spring of 1991.

TABLE #1

CULTIVAR	% SURVIVAL RATE **	VIGOUR (TOP GROWTH)
Male (different clones)	100	excellent
74-55	100	very good
Anna	75	good
Michigan State	25	fair
Meader	25	fair
74-8	25	fair
Dumburton	25	fair
Geneva	0	poor
70-62	0	poor

** The percentage survival rate is determined by dividing the number of plants planted by the number of plants remaining.

HERBICIDE DEMONSTRATION ON STRAWBERRY CULTIVAR CAVENDISH: Seven herbicides at high and low rates were tested in 15 separate treatments to evaluate their effectiveness on weed control and crop tolerance. Weed control was most effective on the plots where high rates of Sinbar, Simazine, + Treflan were applied. Good weed control was evident on the Sinbar, Simazine + Treflan plots where low rates were applied. At both high and low rates the treatments , Dacthal, Devrinol, Enide and Tenoran were not as effective. The treatments Sinbar(H+L)[1], Sinbar(H) + Simazine(H) and Tenoran(H) showed characteristic symptoms of herbicide damage, seen in the field as : For Sinbar (H): stunted plant growth, yellow leaf surfaces. For Simazine(H): yellow halo around the leaf margins. For Tenoran (H)+(L): stunted plant growth, yellow blotches on leaf surfaces. In 75% of the plots where high spray rates were applied we found less runners on average that the same treatments with lower rates. This information was made available to strawberry growers throughout N.B. at an Open House held October 11, 1990 at the Grand Falls Regional Office. Approximately 35 growers and agricultural students attended.

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[1] H = high rates
L = low rates

In 1991, harvest results should give a better indication of how the strawberries are affected by high and low rates.
Acknowledgements: Thanks to Kevin McCully for his involvement in setting up the trial and attending the Open House."C".

GOOSEBERRY TRELLISING TRIAL: All plants from the 1989 plantation were removed and replaced by new gooseberries from the Netherlands. These gooseberries will be trained on the Trellis system. A total of 82 Gooseberries were planted 1 meter apart in a randomized design ,3 rows x 21 + 1 row x 19. Each plant was fertilized with 10-52-10 at a rate of 50 g/5.0 litres of water. The cultivars include; Winham's Industry, Rosko, Whitesmith, May Duke, Achilles and Careless. Fungus diseases, rust and powdery mildew were detected on the branch tips on many of the Gooseberries. This has caused reduced plant vigour in many cultivars. The Gooseberries were sprayed with Captan 50WP to control the fungus disease at the rate of 4.5 kg/ha. on August 15, 1990.

NEMATODES IN NEW BRUNSWICK STRAWBERRY FIELDS: Soil and plant root samples were taken from strawberry fields throughout the province to identify the various types and levels of nematodes. Pratylenchus spp. (Root lesion) nematode was detected in 34 of 47 sites. The population densities ranged from 8,000 root lesions/kg soil to 20 root lesion/kg soil. Meloidogyne spp. or, Root Knot nematodes were detected in 2 of 37 fields in densities that ranged from 1000 root knot/kg soil to 40 root knot/ kg soil. The same nematode was found on the roots of 15 of 16 sites with population densities ranging from, 2 root knot per g of root to 446 per gram of root. The nematode, Paratylenchus projectus (Pin) was detected in 25 of 37 sites and ranged from 1840 Pin/kg soil to 20 Pin/kg soil. The Helicotylenchus (Spiral) nematode was identified in 2 of 37 sites in densities of 1120 Spiral/ kg soil and 80 Spiral/kg soil. The following types were detected in 1/37 sites : Tylenchorhynchus spp. (Stunt); Criconemoides spp. (Ring); Longidorus spp. (Needle). According to economic threshold levels, only the root lesion and root knot nematodes were found in densities high enough to warrant treatment either by fumigation or by growing a rotation crop. The root knot nematode has a high multiplication rate in the field and therefore a low threshold level of 500 kg/soil for commercial plantings. This trial will continue in 1991 when both strawberry and raspberry fields will be sampled. "C".

THE ROW COVER ADVANTAGE: Many row covers will be tested for their beneficial effects on strawberry plants. The perforated polyethylene(stabilized U.V.) row cover with

500 holes(3/8" in diameter) per square meters was installed on November 15, 1990, at Vincent Kelly's farm in Silverwood, New Brunswick. The cultivar Veestar is growing on that trial site.

Three treatments were established in a complete randomized block design replicated four times. They are: Straw over the strawberry plants; No covering material; Perforated polyethylene with 500 holes/m^2.

A datalogger is recording the temperature at 4 inches in the ground under the strawberry plants and at crown level for all treatments and one thermistor is recording the air temperature in a Stevenson Screen.

Winter survival, yield, harvest dates, fruit size, and disease susceptibility will all be evaluated in 1991.

By fall 1993, the New Brunswick strawberry growers should be in a better position to decide which material they should use and which one is more cost effective. **"C".**

RENOVATION PRACTICES FOR STRAWBERRIES:

In New Brunswick we presently recommend to the growers to do postharvest mowing and narrowing (renovation) for all strawberry cultivars. Results with defoliation have varied widely among cultivars, and a full canopy of leaves appear necessary for successful flower initiation (Chandler, 1988).

The delay in the formation of a second node on the runners caused by root pruning and defoliation of the mother plant could be a disadvantage in the field because fruit yield has been correlated to rooting date (Chandler, 1988). Whether the reduced runner formation affects yield will depend on the influence of runner production on plant density (Chandler, 1988).

Two strawberry cultivars (Veestar and Blomidon) were planted in a sandy soil at the N.B. Horticulture Center in Hoyt, N.B. in 1990 in a randomized split plot with three replications. The plantation was fertilized, hand weeded, and covered with straw. The pH of the soil was 5.8 and the organic matter 2.1%. The phosphate and the potash were rated very high, the calcium medium and the magnesium high.

The ten treatments are: **T1**-full renovation (fr)(mowing and narrowing) immediately after harvest ; **T2**-fr two weeks after harvest; **T3**-fr four weeks after harvest; **T4**-narrowing of rows (nr) only after harvest; **T5**-nr two weeks after harvest; **T6**-nr four weeks after harvest; **T7**-no mechanical renovation; **T8**-mowing (m) only after harvest; **T9**-m only two weeks after harvest; **T10**-m only four weeks after harvest.

The trial site will be harvested in 1991 and the renovation treatments applied. Influence of the treatments will be studied after the 1992 harvest. **"C".**

"C"= Partially funded by the Canada/New Brunswick Cooperation Agreement on Agri-Food Development.

REFERENCES: Chandler, C.K.., D.D. Miller, and D.C. Ferre. 1988. Influence of leaf removal, root pruning, and soil addition on the growth of greenhouse-grown strawberry plants. J. Amer. Soc. Hort. Sci. 113 (4): 529-532.

BEE ATTRACTANT EVALUATION

S. Stuible, C. Murray

ABSTRACT: BeeScent, a commercial bee attractant, did not increase fruit set on MacSpur trees over the use of beehives alone. Bee activity was actually lower on the treated trees, suggesting some problems with the experiment negatively biased the results.

ÉVALUATION D'UNE SUBSTANCE ATTRACTIVE POUR LES ABEILLES

Résumé: Le produit commercial BeeScent est une substance attractive pour les abeilles, mais il n'a pas favorisé une meilleure fructification sur les arbres de variété MacSpur par rapport à l'utilisation des ruches seules. En fait, on a plutôt constaté une réduction de l'activité des abeilles sur les arbres traités, ce qui permet de déduire que certains facteurs ont eu un effet négatif sur les résultats de l'essai.

INTRODUCTION: A commercial bee attractant, BeeScent, has recently been introduced after studies in Washington State suggested bee activity and fruit set were enhanced by as much as 27% and 13%, respectively. Poor pollination is often a limiting factor in New Brunswick, whether due to poor conditions or insufficient beehives. However, the reports from Washington State did not distinguish between effects due to increased foraging activity of the hive bees and effects due to attracting bees from unsprayed blocks. If the latter proves to be the main method of increased fruit set, any gains from the use of this bee attractant would be made at the expense of fruit on unsprayed blocks. In addition, these reports made no reference to any effects on wild bees, which are relied on quite heavily for the pollination of New Brunswick orchards.

This trial attempts to distinguish between these different effects.

Because honeybees will soon seek out the best pollen and nectar sources over long distances, it was necessary to separate the sprayed and the check block and to evaluate bee activity levels soon after hive placement. It was hoped that this would enable the differentiation between increased activity and increased immigration of the honeybees. As well, wild bee activity was also investigated.

MATERIALS AND METHODS: This experiment was conducted in Prince William, N.B., on Macspur trees. Three plots were selected so that the treated Plot I (BeeScent and beehives) was geographically separated from Plot III (beehives alone) by the control Plot II (neither beehives nor BeeScent). From each plot 10 similar trees were selected and within each tree, four branches were tagged (one from each quadrant) and flower clusters were counted.

Beehives were placed in Plots I and III at early bloom (May 26), after dandelions had been mowed. Application of BeeScent was made at label rates to Plot I in early afternoon. Bee activity was measured after one hour by counting the number of bees on each tree in each plot over the span of one minute. These counts were repeated several times at regular intervals over the next five days, although when necessary counts were postponed until the weather conditions were more favourable to bee activity.

Just prior to the application of chemical thinners (June 19), the number of fruitlets per selected branch was counted. Finally, fruit set was determined by a fruit count on August 10. Harvest of the selected branches to determine seed counts and fruit characteristics was contemplated, but due to the use of summer pruning on one plot only (Plot I) it was decided the results would not be useful.

The results were tabulated and analyzed using the NumberCruncher Statistical System GLM Anova using covariates where appropriate.

Before discussing the results, one should note there were two factors which complicated this trial.

1) Good beehives were in short supply and so the actual placement rate fell well below the recommended 1 hive per acre. The hives were of quite variable strength, as judged by the activity around their openings.
2) Separation of Plot I and Plot III was **too** successful. Plots II and III were far enough downhill from Plot I to cause them to bloom one day earlier. This first day was critical to establish bee foraging patterns, and so the unsprayed plots may have been favoured during the contracted pollination period.

RESULTS AND DISCUSSION:

Bee Activity

The results of the bee counts are presented in Table 1, below. They are shown in terms of total bees per tree as counted over the five day period. A similar pattern was exhibited for each of the eight individual counts, and so these results were not shown. In an attempt to correct for the difference in bloom periods discussed above, another analysis was conducted using only those counts made during similar bloom conditions. However, this did not change the pattern shown in Table 1 and so it is not included here.

Table 1. Effect of BeeScent on Bee Activity (Sum of Eight One-Minute Counts over Five Days per Tree)

Plot	Treatment	Honey Bee Count	Wild Bee Count	All Bee Count
I	BeeScent + beehives	10.1_a	2.9_a	13.0_a
II	Control	18.8_b	5.0_b	23.8_b
III	Beehives only	29.2_c	7.4_c	36.6_c
	ANOVA Prob>F	0.0000	0.0025	0.0000

In general, bee activity was lower than desired in all plots. However, bee activity was significantly **lower** in Plot I where the BeeScent was applied than in either of the unsprayed plots. More predictably, the bee activity in the Plot III (with hives) was significantly higher than in Plot II (without hives).

While there was a difference in the counts for honeybees and wild bees, the same pattern emerged over the different treatments as for the all bee tallies. To the extent that the attractant is tailored to honeybees, this conformity suggests that factors outside of the experiment (possibly bloom period) might account for the failure of the attractant to increase bee activity.

Fruit Set

The results of the fruitlet and fruit counts are expressed in Table 2. Initial cluster count was factored into the analyses as a covariate. Five different analyses were conducted: fruitlets per branch (as conunted June 19); fruit per branch (as counted August 10); fruitlets per cluster; fruit per cluster; and fruit per fruitlet (a measure of initial drop).

Table 2. Effects of BeeScent on Mean Fruit Set (per Branch)

Plot	Treatment	Fruitlets	Fruit	Fruitlets per Cluster	Fruit per Cluster	Fruit per Fruitlets
I	BeeScent + Beehives	21.80_{ab}	7.318_{b}	1.535_{a}	0.499_{b}	0.358_{a}
II	Control	19.38_{a}	5.787_{a}	1.390_{a}	0.403_{a}	0.325_{a}
III	Beehives Only	23.91_{b}	8.094_{b}	1.653_{a}	0.555_{b}	0.382_{a}
	ANCOVA Prob>F	0.1184	0.0106	0.1795	0.0087	0.4202

The analyses showed little significant effect of any treatment on initial fruit counts (neither fruitlets nor fruitlets per cluster). The final fruit set (either as Fruit or Fruit per Cluster) was significantly increased by the use of beehives. However, the use of BeeScent did not affect fruit set either way.

Taken together, the results of the bee counts and the fruit counts are show the benefits of the use of beehives. However, the effects of BeeScent are less conclusive. The possible negative effects on bee activity were not evident in the final measure of pollination success, fruit set. Given all the extenuating circumstances, this trial should be repeated if a more conclusive statement about the effects of BeeScent is desired.

REFERENCES

Mayer, D.F., R.L. Britt, J.D. Lundern. Evaluation of BeeScent as a Honey Bee Attractant. American Bee Journal. January 1989 Vol 129 (1): 41-42.

ASSESSMENT OF PLUM AND CHERRY CULTIVARS

S. Stuible, C. Murray, R. Tremblay

ABSTRACT: A planting of promising plum and cherry cultivars was made in the Provincial Orchard in Fredericton in 1983. Of the 17 cultivars planted, only 10 have survived reasonably well and only four have produced harvestable quantities of fruit.

ÉVALUATION DE CULTIVARS DE PRUNIER ET DE CERISIER

Résumé: Des cultivars prometteurs de prunier et de cerisier ont été plantés en 1983 dans le verger provincial à Fredericton. Des 17 cultivars plantés, il n'en reste que 10 en assez bon état et seulement quatre ont produit des fruits en quantité suffisante pour justifier une récolte.

INTRODUCTION: During the past decade, a number of new, reportedly hardy, plum and cherry cultivars have been introduced. Many of these cultivars have been established at the Fredericton Observation Orchard in order to determine their hardiness and productivity in this climate.

MATERIALS AND METHODS: All cultivars were planted in 1983 and 1984. Cultivar performance has been recorded in Adaptive Research Reports for 1984, 1985, 1986, 1987 and 1988. The plum cultivars are: METHLEY; BURBANK; YELLOW EGG; CALIFORNIA BLUE; OZARK; VALOR; OTTAWA 3010 (VANIER); SUPERIOR; EARLY GOLDEN; STANLEY; MOUNT ROYAL and BLUE FREE. The cherry cultivars are: METEOR; NORTHSTAR; STELLA; MONTMORENCY and WINDSOR.

RESULTS AND DISCUSSION: The 1989 harvest was too small to be recorded - there were virtually no plums and any cherries which set were taken by the birds before they were ripe enough to pick. Fruit set in 1990 was much better, and the bird pressure was negligible. However, only two cultivars each of cherry and plum produced any noticeable harvest, and these are reported in Table 1.

Cherries: Neither Windsor nor Stella cultivars have proven themselves hardy in this climate - nearly all of the trees have died and those that survive are doing so only barely. The Montmorency trees are somewhat better, but their bloom and subsequent fruit load was very light.

Meteor and Northstar are more promising cultivars for this region. The best producer (with the healthiest looking trees) was Meteor, with six out of seven trees producing an average of 3.55 kg per producing tree. Northstar trees were more variable - only five out of seven trees produced fruit and only three of these trees produced over 1 kg of fruit (with one over 8 kg).

Table 1. 1990 Fredericton Research Orchard Plum and Cherry Harvest

	Plums (kg)		**Cherries (kg)**	
TREE	**Mount Royal**	**Stanley**	**Meteor**	**Northstar**
1	2.72	NA	3.9	1.8
2	15.08	NA	2.4	1.1
3	9.25	NA	5.2	1.5
4	25.09	NA	4.4	0.4
5	16.75	NA	3.6	8.2
6	3.54	NA	1.7	
7	8.22			
TOTAL	80.65	15.48	21.3	13.05
MEAN	11.52	2.58	3.55	2.61
STD	7.38		1.17	2.85

Plums: Several of the plum cultivars have proven unsuitable for this climate. There are no surviving trees of four cultivars - Superior, Yellow Egg, Methley and Early Golden. In addition, one or two trees have died of each of another four varieties - Burbank, Ottawa 3010 (Vanier), Valor and Mount Royal. The only cultivars which have experienced no tree death are California Blue, Ozark, Blue Free and Stanley.

Only Mount Royal and Stanley produced any harvestable yields in 1990. Mount Royal was the most prolific with an average of 11.5 kg per tree picked in mid-September. The fruit was of good quality (sweet but firm) but somewhat plagued by Plum curculio. The Stanley trees produced an average of 2.6 kg of fruit that was still too tart even though it was not picked until early October, just prior to the first frost.

REFERENCES: Tremblay, R., E.N. Estabrooks, G.W. Reed, 1984. Assessment of Plum and Cherry Cultivars. Adaptive Research Reports. N.B.D.A.R.D. Vol. 6,5.

Tremblay, R., E.N. Estabrooks, G.W. Reed, 1985. Assessment of Plum and Cherry Cultivars. Adaptive Research Reports. N.B.D.A.R.D. Vol. 7,6.

Tremblay, R., E.N. Estabrooks, G.W. Reed, 1986. Assessment of Plum and Cherry Cultivars. Adaptive Research Reports. N.B.D.A. Vol. 8,11.

Tremblay, R., E.N. Estabrooks, G.W. Reed, 1987. Assessment of Plum and Cherry Cultivars. Adaptive Research Reports. N.B.D.A. Vol.9,4.

Tremblay, R., D.A. Arnold, E.N. Estabrooks, 1988. Assessment of Plum and Cherry Cultivars. Adaptive Research Reports. N.B.D.A. Vol.10,8.

VEGETABLES - LÉGUMES

EVALUATION OF NEW AND CONVENTIONAL PLASTIC MULCHES FOR THE PRODUCTION OF CUCUMBERS AND MUSKMELON.-HOYT,NB

G.Chevrier,L.Rankin,G.Read and S.Coy.

Abstract: Direct seeded cucumber (cv.Marketmore 76) and transplanted muskmelon (cv.Alaska Hybrid) crops were grown in six different mulch films and compared to bare soil control. All mulch treatments, with the exception of white on black film, hastened seedling emergence and flowering in cucumber,increased soil temperatures, advanced the time to first harvest in cucumber and muskmelon and increased harvest weights when compared to the control. Plants grown on infra-red transmitting(IRT) mulch "AL-OR" yielded best in both trials. A second IRT mulch IRT-76 performed better than conventional black plastic in the cucumber trial but not in the muskmelon trial. Premature degradation of a photodegradable film after 3 weeks into the trial appeared to be more detrimental to the direct seeded cucumber plots than the transplanted muskmelon plots.

ÉVALUATION DE PAILLIS PLASTIQUES NOUVEAUX ET CONVENTIONNELS POUR LA PRODUCTION DE CONCOMBRES ET DE MELONS BRODÉS - HOYT (N.-B.)

Résumé: Des concombres de variété Marketmore 76 semés en pleine terre et des melons brodés transplantés de type hybride Alaska ont été cultivés sous six différents paillis et dans un dispositif témoin non paillé. À l'exception du paillis blanc sur noir, tous les paillis ont eu pour effet d'accélérer la levée des semis et la floraison des concombres, d'élever la température du sol, de rapprocher la première récolte de concombres et de melons brodés et d'augmenter le poids des récoltes par rapport à celui du dispositif témoin. Le paillis sensible à l'infrarouge "AL-OR" a donné les meilleurs résultats dans les deux essais. Un autre paillis 7de même type (IRT-76) a donné de meilleurs résultats que le paillis conventionnel de plastique noir pour la culture du concombre, mais non pour celle du melon brodé. La dégradation trop rapide d'un paillis photodégradable après trois semaines d'essais a semblé plus préjudiciable aux concombres semés en pleine terre qu'aux melons brodés transplantés.

INTRODUCTION: Cucurbit crops respond to most applications of soil applied mulches because of soil moisture retention, heat retention, weed control and improved crop quality.The use of plastic films is now standard procedure in the production of cucumber, melon, squash and pumpkin. Over the past few years, a great deal of experimentation has been conducted on a range of crops and different combinations of mulching and row cover materials. Along with an increase in our understanding of how plants adapt to environmental modification, the industry has seen a rapid development of plastics technology. High quality materials have been introduced that are easy to apply over most soil types, display good characteristics of durability throughout the season and are light in weight.

Among the benefits listed above, perhaps soil heat retention and temperature elevation play a most significant role in vegetable production in temperate areas where cool spring soil temperatures can be limiting. Clear plastic films provide the best heating action since they allow for the transmission of infra-red radiation through the material and directly to the soil surface. Black plastic mulches on the other hand tend to absorb this infra-red heat source thereby limiting the conduction of heat energy to areas where the plastic is in direct contact with the soil surface. The recent development of infra-red transmitting "IRT" materials should provide soil heating at a level comparable to clear plastic. At the same time, IRT materials provide weed control like black plastic since they can be manufactured with a colour tint that will screen out photosynthetically active radiation "PAR" which allows weed seeds to germinate. In effect, the material is somewhat wavelength selective.

This study was conducted to evaluate a range of different plastic materials in the production of cucumber and muskmelon. IRT and conventional materials were used in comparison to control treatments.

MATERIALS AND METHODS:Cucumber- The trial was conducted at the NB Agriculture Horticulture Research Station at Hoyt,NB. Prior to planting, the site (loamy sand) was limed to a pH of 6.3 and 10 tons of cattle manure were applied. In addition, 15-15-15 @ 400 kg/ha was broadcast and disked under. Cucumber (cv. Marketmore 76) seed was sown on June 7 into one of six mulch treatments or bare soil control. The mulch treatments included two plastic films supplied by PlastiTech Inc of St.Remi, Qc.(photodegradable and Thermic mulches), two films supplied by Lecofilms of Rexdale, On. (black and double extruded white on black film), a green IRT film supplied by Ken-Bar of Reading,Mass.(IRT-76 Sunfilm) and a brown IRT film supplied by CDK International of Marietta,Ga.(AL-OR).
The mulch treatments were applied using a randomized complete block design with 4 replicates. Within rows, plants were spaced at 30 cm (13 plants per row) with an inter row spacing of 1 meter. During the trial, observations on seedling emergence, flowering and yield were recorded.Yields were recorded and graded A,B or C from August 10 to September 21. As well, soil temperatures at depths of 4 and 10 cm were monitored.

Muskmelon- Four week old transplants of melon (cv. Alaska Hybrid) were field set on June 11. The transplants were raised in a peat based substrate in 3 inch Jiffy strip pots. The same site preparations as described for cucumber were used as well as a randomized complete block design with 4 replicates. All but the double extruded white on black film was used for mulch treatments on melon. Within rows, melon transplants were spaced at 1.5 meters (7 plants per row) with an inter row spacing of 1.5 meters. Harvest yields were recorded from August 16 to September 21. Fruits were harvested as close to the slip stage as possible. Only saleable fruits were recorded.

RESULTS AND DISCUSSION-Cucumber: The effect of mulch treatment on soil temperatures one week after seeding is illustrated in Figure 1. Cloud cover at 1200 hours on June 13 and 14 kept soil temperatures down around 20 C. Mulch treatments, with the exception of the white on black film increased soil temperatures as compared to the bare soil control. The highly reflective surface of the white on black film impeded any significant soil warming. More apparent soil temperature differences can be seen during the afternoon of June 13 when soil temperatures reached a maximum of 37 C under black plastic. The two IRT and Thermic films increased soil temperature over the control whereas the photodegradable did not. Overnight soil temperatures (0000 hours to 0600 hours) were higher under all mulch treatments except the white on black film.

Percent seedling emergence 7 days after seeding (Table 1) was highest in the IRT-76 and Thermic plots. Seedlings in the white on black and control plots had not emerged after 7 days. Fourteen days after seeding, differences among treatments of seedling emergence were less apparent. Control and white on black mulch plots had 98% and 81% emergence however these plants were slower to develop over the first half of the season. Observations on flower development 6 weeks after seeding (Table 2) reflected this trend with the majority of mulch treatments having 75-85% of plants in flower while the control plots had only 37% of plants at anthesis. White on black mulch plots had the lowest with 13% plants in flower.

Fruit harvest started in all mulch treatment plots(except white on black mulch) on August 10 whereas the initial harvest was delayed by 5 days in control and white on black mulch plots. Total harvest data of A grade fruits (Table 3) showed that the brown IRT "AL-OR" yielded significantly higher than all other treatments (except green IRT-76) for fruit weight and number. White on black mulch and the control plots were significantly lower in A grade fruit as compared to other treatments with the exception of the photodegradable mulch plots. The photodegradable film used in the trial showed signs of premature degradation at about 3 weeks after seeding. This would account for its lower production of fruits. In general, most mulch treatments hastened time to 50% harvest (weight and fruit number basis) of A grade fruit in comparison to the control. On a weight basis, the greatest advantage was noted with the Thermic and brown IRT AL-OR which came into 50% harvest about one week earlier than the control.

Second grade fruit yields are found in Table 4. Fruits with slight skin abrasions and irregular shape were

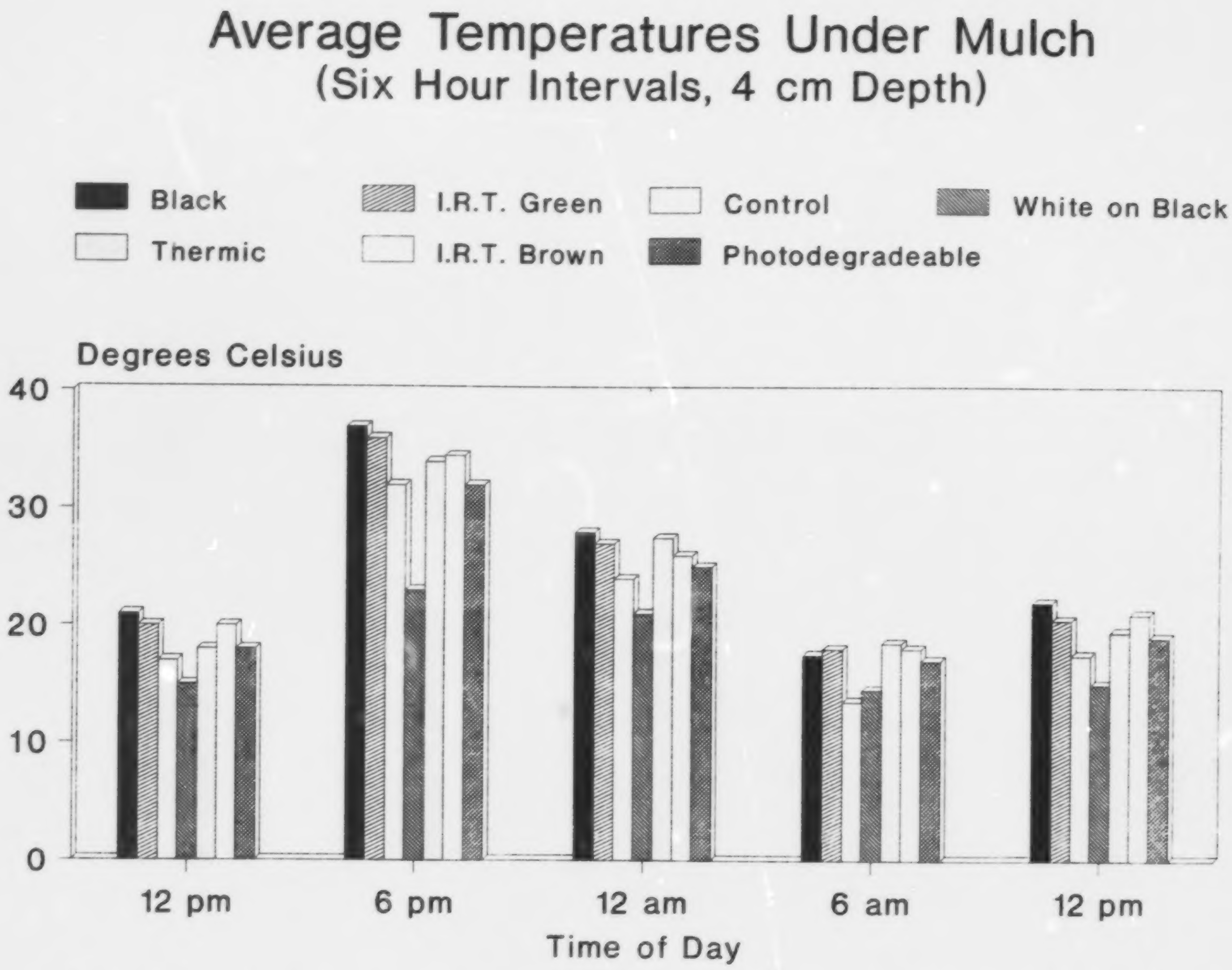

Figure 1: Temperature readings from cucumber (cv. Marketmore 76) plots taken June 13,12 pm until June 14,12 pm, 1990.

considered B grade whereas C grade were culled. The majority of mulch treatments produced significantly higher yields in both categories when compared with the control plots.

Muskmelon: Melon weights from the brown IRT AL-OR, black and photodegradable mulch plots were significantly higher than those from the control (Table 5). Time to 50% harvest of the control plots was delayed by least 9 days when compared to the mulch treatments. The same trend was observed with regards to fruit number however only the brown IRT AL-OR was significantly higher in productivity than the control.

TABLE 1 : Cucumber seedling (cv.Marketmore 76) emergence at 7 and 14 days after planting into various mulching materials. Each value represents the mean of 4 replicates.

Treatment	**7 days after planting**	**14 days after planting**
Control	0%	98%
White on black	0%	81%
Photodegradable	10%	90%
Black plastic	38%	90%
Brown IRT AL-OR	38%	83%
Green IRT-76	52%	81%
Thermic	52%	86%

TABLE 2 : Percent of cucumber plants in flower 6 weeks after seeding into various mulch treatments. Values represent the mean of 4 replicates.

Treatment	**Plants in flower**
Control	37%
White on black	13%
Photodegradable	75%
Green IRT-76	77%
Brown IRT AL-OR	77%
Thermic	85%
Black plastic	85%

TABLE 3: Harvest weights(Kg) and number of A grade fruits per group of 13 plants of cucumber (cv.Marketmore 76) grown in various mulch treatments. Each value represents the mean of 4 replicates.

Treatment	**Weight(Kg) of Grade A Fruits**	**Number of Grade A Fruits**	**Time to 50% Harvest**
Brown IRT AL-OR	69.34 a*	157.5 a	August 23
GreenIRT - 76	65.30 ab	145.5 ab	August 24
Black Plastic	58.30 bc	133.3 bc	August 24
Thermic	58.11 bc	132.8 bc	August 22
Photodegradable	55.22 cd	129.0 bcd	August 27
White on Black	48.05 de	117.5 cd	August 27
Control	45.65 e	112.5 d	August 29

* Means separation within columns by DMRT (P=0.05).

TABLE 4: Harvest weights (kg) of and numbers of B or C grade fruits per group of 13 plants of cucumber (cv. Marketmore 76) grown in various mulch treatments. Each value represents the mean of 4 replicates.

Treatment	B GRADE		C GRADE	
	Wgt(kg) per grp. of 13 plants	fruit no. per grp. of 13 plants	wgt(kg) per grp. of 13 plants	fruit no. per grp. of 13 plants
Black Plastic	12.05 a	33 a	5.18 a	15.3a
Thermic	11.71 a	33 a	4.59 ab	14.3ab
Brown IRT AL-OR	11.27 ab	32.5 a	4.66 ab	14.3ab
Green IRT -76	10.50 ab	28.5 ab	4.66 ab	14.3ab
White on Black	9.28 bc	26.25 ab	1.87 c	6.3c
Photodegradable	8.17 c	23.5 b	2.84 abc	8.3abc
Control	7.96 c	29.0 ab	2.16 bc	6.5bc

Means separation within columns by DMRT (P=0.05).

TABLE 5: Harvest weights (kg) and number of saleable fruits per group of 7 plants of muskmelon (cv. Alaska Hybrid) grown in various mulch treatments. Each value represents the mean of 4 replicates.

TREATMENT	WEIGHT (kg) OF GRADE A FRUITS	NUMBER OF GRADE A FRUITS	DATE OF 50% HARVEST
Brown IRT AL-OR	103.35a*	54.25 a	August 30
Black Plastic	89.01 a	48.25 ab	August 30
Photodegradable	92.64 a	47.25 ab	August 30
Thermic	83.96 ab	45.25 abc	August 29
Green IRT-76	78.74 ab	40.75 bc	August 30
Control	62.73 b	33.50 c	Sept. 8

* Means separation within columns by DMRT(P=0.05).

Although the photodegradable mulch started to breakdown about 3 weeks after transplanting, the yield was not effected as in the cucumber trial. Since the muskmelon trial was conducted using transplants and not direct seeding, the plants had the benefit of the mulch during the early stages of field establishment. In addition, the faster spreading vines of the melon plants would have provided more shade over the surface of the photodegradable film thereby slowing down the breakdown process.

CONCLUSIONS: Early season advantages of more rapid seedling emergence,early flowering and advanced harvest were noted for the majority of mulch treatments over the control. Double extruded white on black mulch proved to be unsuitable as a film for these crops. This was expected since cucurbits are warm season crops that benefit greatly from warm root zone temperatures. The results illustrated the importance of the stability of degradable materials. Premature degradation of mulch film seemed to be more serious in a direct seeded crop(cucumber) as compared to one established by transplants(muskmelon). Direct conclusions to this can only be made however if comparisons were made using the same crop direct seeded and transplanted on the same photodegradable material.

IRT materials performed well under the conditions of these trials.AL-OR (brown IRT) ranked highest in fruit yield by weight and number in both crops. When compared to melon and cucumber plots grown on black plastic, the AL-OR plots displayed yield increases of 16% and 19% respectively. IRT-76 (green) performed better than conventional black plastic when used on cucumber but not on muskmelon. The Thermic material which is associated with characteristics of elevated soil temperatures did not perform to the level that was anticipated.

Although differences were noted among treatments for various yield components, the time to initial harvest and 50% harvest did not vary greatly. This is important especially in a crop like cucumber where the price per dozen can fall drastically over a short period of time, thus a one week earlier jump on the market is quite beneficial. The benefits of IRT mulches will have to be substantial if they are going to be economical, given that the price of some of the newer mulching films is nearly twice that of black plastic.

In general the growing conditions of the 1990 season in NB were quite favourable for the production of cucurbits with several days of temperatures above 25 C. Perhaps under less favourable conditions of limited sunshine and lower temperatures the differences among mulch treatments would have been more dramatic. A similar trial in 1991 using the same materials is planned.

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Eastern Canadian Dry Bean Co-op Test 1990-New Brunswick.

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Abstract: Thirty-three dry bean cultivars were evaluated for their performance under NB growing conditions in 1990. Despite a poor growing season, a number of cultivars showed potential for high yields, low % pick and early flowering. Light red kidney cultivars (SVM 29-21, SVM 37-16, SVM 40-23, California Early LRK, Sacramento, SVM 31-19) and dark red kidney cultivars (ISB 865, IG 6604, Guardian RB 83353 and California DRK-82) performed very well. Ember D79144 (small red) and Agassiz (Pinto) yielded well and were earliest of all cultivars for time to maturity. Overall quality of navy bean cultivars was low because of mould and poor colouring resulting from delayed harvest and a wet fall. Among navy bean cultivars, Seaforth, Mitchell and Centralia were earliest in time to maturity.

ESSAIS COOPÉRATIFS DE L'EST DU CANADA SUR LE HARICOT SEC EN 1990 NOUVEAU-BRUNSWICK

Résumé: En 1990, nous avons évalué le rendement de 33 cultivars de haricot sec dans le contexte du Nouveau-Brunswick. Malgré une mauvaise saison de culture, un certain nombre de cultivars ont donné des signes de rendement élevé, de faible taux de perte à la récolte et de floraison hâtive. On a obtenu un bon rendement avec les cultivars de gros haricots secs rouge pâle (SVM 29-21, SVM 37-16, SVM 40-23, California Early LRK, Sacramento, SVM 31-19) et avec les cultivars de gros haricots secs rouge foncé (ISB865, IG 6604, Guardian RB 83353 et California DRK-82). Le cultivar Ember D79144 de petits haricots rouges et le cultivar Agassiz de petits haricots blancs ont donné de bons rendements et ont été les premiers à parvenir à maturité. Un retard dans la récolte et un automne humide ont causé chez les petits haricots blancs une mauvaise coloration et des moisissures qui ont réduit la qualité de la culture en général. Les petits haricots blancs qui sont parvenus les premiers à maturité appartenaient aux cultivars Seaforth, Mitchell et Centralia.

INTRODUCTION: The dry bean (Phaseolus vulgarus) industry in NB relies greatly on the cultivation of heritage varieties like Jacob's Cattle, Soldier Bean and other coloured bean types rather than the white navy beans that are produced in Ontario. NB producers have an established market for their traditional varieties however recent interest in registered cultivars, including white, pinto, kidney, black, red and cranberry beans has increased. Problems with low yields and seedborne disease (Xanthomonas campestris pr. phaseoli) have helped to develop this interest. In addition, seed costs for heritage type beans are often three to four times higher than the cost for white bean or other registered cultivars that are produced under controlled breeding programs.

This evaluation was started in 1989 in cooperation with dry bean specialists at Centralia College, Huron Park, Ontario. The results of that trial were published in the NB Adaptive Research Reports (Chevrier and Rankin, 1989) in which nine cultivars showed potential for production in NB. During the 1990 season, seven of these cultivars were grown under a market risk program (CAAFD) at Woodstock. This report summarizes the performance of thirty-three cultivars evaluated in 1990. Most of these cultivars were evaluated in 1989. In 1990, the selection of light red kidney cultivars was increased.

MATERIALS AND METHODS: Thirty-three dry bean cultivars

(Table 1) were obtained from Centralia College, Ontario. The cultivar Seaforth was substituted for Isabella (light red kidney) and Sierra (Pinto) which arrived too late for the June 12 planting date. The soil at the test site (Woodstock NB) is classified as a loam with a pH of about 6. Prior to planting, the soil was fertilised with 6-12-12 @ 650 kg/ha and Treflan (ppi) was applied for weed control. Four single line replicates of each cultivar (5 m long) were planted by hand in a randomized complete block design. One seed was planted every 4-5 cm along the row and the inter-row spacing was 36 inches(91.44 cm). Observations on flowering date, maturity and various yield components were made during the growing season and after harvest.
At harvest, the middle 3 meters of each row were sampled.

RESULTS AND DISCUSSION: Yield data (Table 1) indicate that a number of cultivars produced fairly well (>2500 kg/ha) under the trial conditions of 1990. Overall yields were higher than those of 1989. Four white bean (Gryphon, Rocket, Wesland and Centralia), four dark red kidney (IG-6604, Guardian RB-83353, California DRK 82 and ISB- 865), three light red kidney (SVM 29-21, SVM 37-16, SVM 40-23 and California Early LRK) and one small red type (Ember D 79144) were within the higher yielding range. It should be noted that the yields of cultivars Gryphon, ISB-865, IG-6604, SVM 29-21 and SVM 37-16 were high despite the very poor performance of plots in replicate 1 which were stressed by excess moisture in late summer. Arestuben (yellow eye), Maine Yellow Eye,and Jacob's Cattle were among the lowest yielding cultivars in the trial.

Losses due to poor quality were quite high in some cultivars as indicated by the data for percent pick (Table 1). Percent pick (determined from the total harvested yield) was highest among navy (34-82%) and cranberry type (49-76%) cultivars and less severe among light and dark red kidney bean cultivars (5-20%). Relatively low pick levels were noted among the other coloured bean cultivars (pinto, pink and small red) included in the trial. High percent pick is attributed to poor weather conditions encountered at the end of the season and at harvest. Rainy conditions prevailed through most of September and October. Discoloration and moulding of beans in the pod was noted prior to harvest. Unusually warm weather delayed maturity and harvest (Table 2). High losses due to poor quality were incurred even though the plots were hand harvested and dried indoors.

One hundred seed weight and quality scores (Table 1) were based on graded bean samples. Lower quality scores given to navy type beans were due mostly to poor colour (off white to grey) whereas discoloration and yellowing of the hilum resulted in lower scores of the other coloured bean

TABLE 1- Comparison of selected yield parameters of dry bean cultivars. Figures for yield and % pick represent the mean of 4 replicates. One hundred seed weight and quality score (1=excellent,5=poor) are based on graded samples.

NAME	MARKET CLASS	YIELD (kg/ha)	% PICK	100 SEED WGT.(g)	QUALITY SCORE (1-5)
Seaforth	white	2226	72	22.8	2
Sprint	white	1722	82	24.8	3
Cygnus	white	2194	62	23.6	2
Gryphon	white	2602	56	20.8	1
Midland	white	1990	69	19.4	2
Rocket	white	2660	51	24.7	1
Wesland	white	2615	70	23.7	1
Stinger	white	2168	39	21.1	1
Mitchell	white	2277	42	19.8	1
Centralia	white	2607	62	25.7	2
Harokent	white	2290	57	26.9	1
Dresden	white	2258	34	21.2	1
Schooner(RB83045)	white	1913	57	20.0	3
Taylor Hort.	cranberry	1888	76	53.8	3
SVM Cranberry	cranberry	2436	49	64.2	2
IG 6604	dark red kidney	2609	20	60.3	2

Guardian(RB83353)	dark red kidney	3372	05	58.9	1
California DRK-82	dark red kidney	3074	13	65.4	1
ISB 865	dark red kidney	2672	06	70.0	1
Sacramento	light red kidney	2156	17	59.3	2
Seaforth	white	1505	50	21.1	3
SVM 29-21	light red kidney	2621	13	61.5	2
SVM 31-19	light red kidney	2226	14	60.4	2
SVM 37-16	light red kidney	2584	11	62.3	2
SVM 40-23	light red kidney	2927	20	68.5	1
Cali. Early LRK	light red kidney	2634	11	64.4	2
Arestuben	yellow eye	1773	52	50.5	2
Kenearly	yellow eye	2385	30	60.9	2
Maine Yellow Eye	yellow eye	1008	34	45.3	1
Soldier	heirloom	2079	39	65.0	2
Jacob's Cattle	heirloom	1654	29	61.8	2
NS-N-1	Marrow	2156	27	40.9	2
RB 85312	pink	2028	21	38.9	1
Seaforth	white	2022	66	22.2	3
Agassiz(D811278)	pinto	2143	10	46.4	1
Ember(D79144)	small red	2656	15	42.4	1

TABLE 2- Comparison of flowering date, time to maturity, harvest date and growth habit of dry bean cultivars.

Name	Time to flowering (DAP)	Time to maturity	Harvest date	Growth Habit
Seaforth	July 30 (48)	Sept 26	Oct 20	2a
Sprint	July 29 (47)	Oct 09	Oct 20	3a
Cygnus	July 30 (48)	Oct 09	Oct 20	1
Gryphon	July 26 (44)	Oct 09	Oct 20	2a
Midland	July 28 (46)	Oct 09	Oct 20	3b
Rocket	July 28 (46)	Oct 09	Oct 20	1
Wesland	July 29 (47)	Oct 09	Oct 20	1
Stinger	July 28 (46)	Oct 09	Oct 20	2b
Mitchell	July 26 (44)	Sept 26	Oct 04	1
Centralia	July 26 (44)	Sept 26	Oct 20	3b
Harokent	July 28 (46)	Oct 09	Oct 20	1
Dresden	Aug 03 (52)	Oct 09	Oct 20	1
Schooner	July 27 (45)	Oct 09	Oct 20	3b
Taylor Hort.	July 27 (45)	Sept 26	Oct 20	3a
SVM Cranberry	July 25 (43)	Oct 09	Oct 20	1
IG 6604	July 29 (47)	Oct 09	Nov 02	1
Guardian(RB83353)	July 28 (46)	Oct 09	Oct 20	1

Cali.DRK-82	July 28 (46)	Oct 09	Nov 02	1
ISB 865	July 23 (41)	Oct 09	Oct 20	1
Sacramento	July 22 (40)	Sept 18	Oct 20	1
Seaforth	July 30 (48)	Sept 18	Oct 20	1
SVM 29-20	July 23 (41)	Oct 09	Oct 20	1
SVM 31-19	July 23 (41)	Oct 09	Oct 20	1
SVM 37-16	July 23 (41)	Oct 09	Oct 20	1
SVM 40-23	July 23 (41)	Oct 09	Oct 20	1
Cali.Early LRK	July 23 (41)	Oct 09	Oct 20	1
Arestuben	Aug 03 (52)	Oct 09	Oct 20	3b
Kenearly	July 24 (42)	Oct 02	Oct 20	1
Maine Y.Eye	July 30 (48)	Oct 09	Oct 20	1
Soldier	July 23 (41)	Oct 02	Oct 20	1
Jacob's Cattle	July 23 (41)	Sept 26	Oct 20	1
NS-N-1	July 22 (40)	Sept 26	Oct 20	1
RB85312	July 30 (48)	Oct 02	Oct 20	1
Seaforth	July 30 (48)	Oct 09	Oct 20	3b
Agassiz(D811278)	July 28 (46)	Sept 11	Oct 20	2b
Ember(D79144)	July 28 (46)	Sept 11	Sept 11	3a
			Sept 26	3a

*Growth habit- CIAT classification 1=determinate bush, 2=upright indeterminate vine, 3= prostrate indeterminate vine, a= short vine, b= long vine.

cultivars. Because of the high percent pick in some cultivars, the quality rating should be interpreted carefully.

Chronological observations for flowering,maturity and harvest are outlined in Table 2. Of these three parameters, the ratings for flowering are most reliable since the weather conditions experienced up to that time were somewhat normal. Light red kidney cultivars were among the earliest to flower (40-41 days after planting) along with California DRK 82, Soldier, Jacob's Cattle, Kenearly and NS-N-1. The majority of navy bean cultivars flowered after 46-48 days. Arestuben (yellow eye) and Dresden (navy) were latest to flower at 52 days.

Some cultivars were noted as early maturing (Table 2) even though the late summer growing conditions were somewhat unusual. Maturity was determined by leaf senescence, pod colour and bean seed development. Agassiz (pinto) and Ember (small red) were earliest maturing by September 11. Sacramento (light red kidney) was mature by September 18 while Seaforth (navy), Mitchell (navy), Centralia (navy), Taylor Hort (cranberry), Jacob's Cattle and NS-N-1 were relatively early in maturing by September 26. The majority of the remaining cultivars were rated as mature by October 9. Harvesting was done on September 26 for the earliest cultivars and delayed until October 20 for the majority of others because of wet field conditions.

CONCLUSIONS: 1990 was a difficult season for conducting a dry bean cultivar trial because of extremes in weather that were encountered during the course of the evaluation. Spring planting was delayed because of untimely rain in early June and mid summer growth was set back by dry soil conditions. The trial site was subjected to heavy rains (7 inches in 36 hours) in mid-August and a delayed fall frost allowed most cultivars to keep growing into early October.

Despite these adverse weather conditions, a number of cultivars performed reasonably well. Most of the light red kidney cultivars (SVM 29-21, SVM 37-16, SVM 40-23 and California Early LRK) had high yields, low percent pick and were relatively early flowering. Light red kidney cultivars Sacramento and SVM 31-19 were early flowering and had low pick rates. Sacramento was noted as early maturing. Dark red kidney cultivar ISB 865 yielded well, had a very low percent pick and was early flowering. Dark red kidney cultivars IG 6604, Guardian(RB 83353) and California DRK-82 yielded as well or better than ISB 865 but were 5 to 6 days later in flowering.

Small red cultivar Ember (D 79144) and pinto cultivar Agassiz should be noted since they yielded well, had low percent pick and were the earliest to mature even though they were not observed among the earliest flowering cultivars.

Among the navy bean cultivars, Centralia performed best in yield and time to maturity. Cultivars Seaforth and Mitchell were also early in maturity. The high pick rate for the navy beans grown in the 1990 trial should not label these cultivars as undesirable. Under more normal weather conditions in the 1989 evaluation most of these cultivars had pick rates of around 10%.

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REFERENCES:

Chevrier,G.E.and L.Rankin. 1989. Eastern Canadian Dry Bean Co-op Test-New Brunswick. NB Department of Agriculture Adaptive Research Reports. 11:75-82.

EARLY SEASON CAULIFLOWER AND BROCCOLI CULTIVAR EVALUATION.

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ABSTRACT: Early season broccoli and cauliflower cultivars were grown at two locations (Sheffield and Sussex, NB) and evaluated for yield and quality. Among broccoli cultivars, the sequence for time to maturity for early cultivars was different at each site however a trend for mid season maturity was noted in four common cultivars at both sites. Broccoli head weight and diameter were greater at the Sheffield site. At Sussex, an unusually dry summer resulted in the poor performance of the earliest maturing broccoli and most of the cauliflower cultivars. Only one of eleven cauliflower cultivars yielded greater than 50% marketable heads at Sussex whereas four of eight cauliflower cultivars grown at Sheffield produced about 75% marketable heads. The adverse growing conditions experienced early in the growing season influenced the performance of most of the cultivars in the trial.

ÉVALUATION DE CULTIVARS HâTIFS DE CHOU-FLEUR ET DE BROCOLI

Résumé: On a évalué le rendement et la qualité de cultivars hâtifs de brocoli et de chou-fleur à deux endroits au Nouveau-Brunswick, Sheffield et Sussex. La période pour parvenir à maturité était différente à chaque endroit pour les cultivars hâtifs de brocoli, mais l'on a constaté que la maturation à la mi-saison était semblable pour quatre cultivars cultivés aux deux endroits. Le poids et le diamètre de l'inflorescence du brocoli étaient supérieurs à Sheffield. L'été exceptionnellement sec dans la région de Sussex s'est soldé par un mauvais rendement des cultivars hâtifs de brocoli et de la plupart des cultivars de chou-fleur. À Sussex, seulement un des onze cultivars de chou-fleur a produit plus de 50 p. 100 d'inflorescences commercialisables, tandis que quatre des huit cultivars de chou-fleur produisaient environ 75 p. 100 d'inflorescences commercialisables à Sheffield. Les mauvaises conditions de croissance au début de la saison ont nui au rendement de la plupart des cultivars soumis à ces essais.

INTRODUCTION: Early season production is a strategy common among horticultural producers who want to capitalize on the market while prices are still strong. In most cases, early season production can be accomplished with the selection of early maturing cultivars and the use of row covers or ground mulches. The situation is however different in the production of broccoli and cauliflower. While these crops can benefit from the use of row covers to hasten maturity, the early season cultivars themselves are often not ideal in their characteristics of head size, bead size, compactness and wrapper leaf development. Cultivar selection for this market is therefore difficult because of the uncertainty of how a cultivar will perform in response to spring or early summer conditions.

This study was conducted to evaluate a range of early season broccoli and cauliflower cultivars.The results of this trial will be compared to the trials conducted at Ag Canada Sen.Michaud Research Station.

MATERIALS AND METHODS: Sixteen broccoli and eleven cauliflower cultivars were evaluated at two sites in NB; Sheffield (Interval soil) and Sussex (loam soil). The seed for both trials was supplied by P.V.LeBlanc(Ag Can). All cultivars were seeded in commercially prepared growing mixes and grown in Plastomer 200 seedling trays at the trial sites. Field transplanting in Sussex took place on May 29 (broccoli) and June 1 (cauliflower). At the Sheffield site, transplanting was done on June 4 for both crops. The trials were laid out using a randomized complete block design with single line replicates. Four replicates were used. Plant spacing within the row was 16 inches (40 cm) with 36 inches (90 cm) between rows. Prior to planting the sites were limed and fertilized as recommended by soil test. Harvesting was done every 4 to 5 days. At harvest, head weight and diameter were recorded. Quality ratings were given to each cultivar.

RESULTS AND DISCUSSION: Broccoli: Tables 1 and 2 outline yield components and time to 50% harvest. Head size and diameter are subjective ratings given the rapid development that broccoli can undergo just before harvest. These values are however included since the 1990 season was especially warm and dry. As a result, harvesting in the test plots was done while reasonable market quality could still be assured even if the product was slightly under sized.

Yield data and maturity ratings taken at the two sites are quite different. The degree of moisture stress experienced at the Sussex site was more severe during the evaluation. Marathon produced the largest head size and diameter (Table 1) at the Sheffield site while no significant difference was noted among the majority of the remaining cultivars. Again this is a reflection of the need to harvest while market quality was still apparent. For example Pinnacle was harvested at Sheffield when the head size was about 16-18 cm in diameter. Any delay in harvest resulted in low head quality because of uneven shape or poor coloring. Head weight was notably lighter at the Sussex site. Cultivars Fieldcrest, Buccaneer and Improved Comet were omitted from the analysis at Sussex because of insufficient data. The same is true for Fieldcrest at the Sheffield site.

A trend was observed for time to initial and 50% harvest (Table 2) with cvs. Premium Crop, Emperor, Pinnacle and Green Valiant being later maturing at both sites. No definite trend was noted among cultivars for early maturity. Further indication of the effect of stress at the Sussex site can be seen in the fact that Improved Comet displayed mid season maturity characteristics instead of typical early season traits.

Under the conditions experienced at the Sheffield site, cvs. Buccaneer, Cruiser, Emperor, Premium Crop, Prominance and Pinnacle appeared to be fairly even in maturity. For example, the time to initial harvest and 50% harvest was often the same or 2 days apart for each of these cultivars. At Sussex, the same could be said for cvs. Pinnacle and Green Valiant.

Table 1 - Harvest data for broccoli cultivars grown at two locations - values represent the mean of 4 replicates.

Cultivar	SHEFFIELD		SUSSEX	
	Head wgt. (g)	Diameter (cm)	Head wgt. (g)	Diameter (cm)
Marathon	660.6 a*	20.4 a	NP	NP
Cruiser	530.2 b	17.6 bc	117.8 d	11.9 c
Chancellor	508.6 b	17.8 bc	NP	NP
Green Valiant	506.4 b	17.0 bc	387.6 a	15.3 a
Prominance	506.1 b	18.1 b	232.3 bcd	12.5 bc
Paragon	499.4 b	17.7 bc	NP	NP
Premium Crop	443.8 bc	16.9 bc	284.5 b	14.1 ab
Emperor	431.5 bc	16.4 bc	280.3 bc	13.3 bc
Goliath	427.3 bc	16.2 bc	211.4 a	12.1 c
Pinnacle	385.3 cd	16.8 bc	366.6 a	15.6 a
Improved Comet	366.6 cd	15.8 c	-	-
Buccaneer	279.9 d	12.9 d	-	-
Fieldcrest	-**	-	-	-
Eureka	NP ***	NP	355.1a	15.8 a
Zeus	NP	NP	226.2 bcd	12.8 bc
Mariner	NP	NP	213.5 cd	12.3 bc

* Means separation within columns by Duncan's Multiple Range Test (P=0.05)
**-)Insufficient data to perform analysis
*** Not planted at that site (NP)

Table 2: Time to initial and 50% harvest of broccoli cultivars grown at two locations. Values in brackets represent actual number of days from transplant. Based on the mean of 4 replicates.

Cultivar	SHEFFIELD		SUSSEX		Cultivar
	Initial Harvest	50% Harvest	Initial Harvest	50% Harvest	
Buccaneer Improved Comet	July 10 (36) July 10 (36)	July 12 (38) July 19 (45)	July 12 (44) July 12 (44)	July 16 (48) July 16 (48)	Goliath Zeus
Field Crest* Goliath	July 12 (38) July 16 (42)	July 19 (45) July 27 (53)	July 12 (44) July 12 (44)	July 16 (48) July 19 (51)	Mariner Fieldcrest*
Paragon Marathon	July 16 (42) July 19 (45)	July 27 (53) Aug. 3 (60)	July 12 (44) July 12 (44)	July 23 (55) July 23 (55)	Cruiser Prominance
Cruiser Chancellor	July 25 (51) July 27 (53)	July 27 (53) Aug. 1 (58)	July 16 (48) July 16 (48)	July 16 (48) July 25 (57)	Buccaneer* Improved Comet *
Emperor Premium Crop	July 27 (53) July 27 (53)	July 27 (53) July 27 (53)	July 19 (51) July 19 (51)	July 31 (63) July 31 (63)	Premium Crop Emperor
Prominance Green Valiant	July 27 (53) July 27 (53)	July 27 (53) Aug. 1 (58)	July 25 (57) July 31 (63)	July 31 (63) July 31 (63)	Eureka Pinnacle
Pinnacle	Aug. 1 (58)	Aug. 1 (58)	July 31 (63)	Aug. 2 (65)	Green Valiant

*Dates based on a low number of observations for this cultivar

Quality characteristics (Table 3) for bead size, yellow eye and compactness were estimated from the data collected at the Sheffield site. Smallest bead size was noted in cvs. Prominance, Pinnacle and Green Valiant. Both Prominance and Pinnacle produced rough and uneven heads at maturity. Green Valiant had some problem with variable bead size within each head. Paragon, Fieldcrest and Goliath produced heads with the largest bead size. Yellow eye was most apparent in cvs. Emperor, Goliath and Eureka (Sussex site). Yellowing of all florets was noted in cvs. Fieldcrest, Buccaneer, Chancellor and Marathon if they were left to mature under the stress conditions experienced. The majority of cultivars produced heads that were compact.

Observations for hollow stem and leafiness (Table 3) were quite different between sites. Bract leaf development was not apparent at the Sheffield site whereas cvs. Emperor, Pinnacle and Eureka displayed leafiness at Sussex. Hollow stem was a more important factor at Sheffield with cvs. Goliath, Green Valiant, Paragon and Prominance having greater than 70% of this trait at harvest. These cultivars all reached 50% harvest on July 27 (Table 2). On July 27 and August 1 slightly more than 50% of all broccoli harvested at the site had hollow stem.

The following comments highlight some of the more noticeable characteristics of the cultivars grown at Sheffield: Cvs. Emperor, Pinnacle and Green Valiant were generally of good quality. Fieldcrest produced uneven heads that tended to develop yellow/orange buds at maturity. The same was noted for cvs.Buccaneer and Chancellor. Chancellor produced heads with thin stems which were quite easy to cut and trim.The same was noted for Paragon. Prominance produced very bumpy unattractive heads. Marathon tended to develop yellow florets at maturity. As well, this cultivar had thick stems which made cutting and trimming difficult.

Cauliflower: Harvest data and marketable yield (percent of crop harvested) summarized in Table 4 illustrate the effect that the growing conditions of the 1990 season had on the various cultivars. Substantial losses were incurred because of tip burn problems, poor wrapper leaf development, off coloured curds or extreme curd riceyness. These losses were greater at the Sussex site where less than one third of the potential harvest was made in all but one cultivar. Under the conditions of this trial, cvs. Andes, Ravella, Siria and White Top performed best at Sheffield while only Plana gave reasonable results at Sussex.

Quality observations (Table 5) were made on marketable curds at Sheffield. Tavia was the only cultivar that

Table 3 - Cultivar & Market Quality Characteristics of Broccoli

Cultivar	Cultivar Characteristics*			Market Quality Characteristics			
				Percent Hollow stem		Leafiness	
	Bead Size	Yellow Eye	Compactness of Head	Sheffield	Sussex	Sheffield	Sussex
Buccaneer	2.3	1.6	1.9	10	0		
Chancellor	2.0	1.7	2.2	20	NP		
Cruiser	2.7	1.3	1.7	42	0		
Emperor	2.6	2.4	2.3	15	0		**
Fieldcrest	3.2	-	2.8	0	0		
Goliath	2.8	2.2	2.4	75	0		
Green Valiant	1.9	2.0	1.5	71	10		
Improved Comet	2.4	1.0	2.3	32	0		
Paragon	2.8	2.0	2.4	88	NP		
Pinnacle	1.9	1.3	1.8	51	4		**
Premium Crop	2.3	1.0	1.7	67	0		
Prominance	1.5	1.0	1.9	89	26		
Eureka	2.0	2.5	1.5	NP	16		**

* Based on average characteristics of crops at Sheffield site. Bead size rated 1-5 (small to very large). Yellow eye rate 1-3 (not apparent to severe). Compactness rated 1 to 5 (very tight to loose).

** Greater than 10% of crop with excessively leafy heads.

Table 4 - Harvest data for cauliflower cultivars grown at two locations. Values represent the mean of 4 replicates.

Cultivar	SHEFFIELD			SUSSEX			
	Head Wgt. (g)	Diameter (cm)	% Harvested	Head Wgt. (g)	Diameter (cm)	% Harvested	Cultivar
Andes	1231	22.6	75	959	18.2	29	Andes
Ravella	1081	22.0	83	794	18.6	33	Ravella
Siria	1059	22.2	75	808	18.9	15	Siria
White Rock	1151	22.3	29	1083	17.7	33	White Rock
White Top	1241	22.0	69	1162	20.2	19	White Top
Fanda	NA	NA	-	NA	NA	-	Panda
Sernio	NA	NA	-	NA	NA	-	Sernio
Tavia	976	21.6	29	1051	18.1	21	Tavia
				597	17.4	21	Glacier
				1131	20.7	27	Snopak
				1037	21.0	58	Plana

showed any significant amount of leafiness. Most cultivars had cream coloured curds resulting from poor wrapper leaf development. Pubescence was quite noticeable in cvs. Tavia, Ravella and Siria. For the most part, all cultivars were reasonably compact.

TABLE 5 - Cauliflower quality observations (from marketable heads) summarized from data recorded at the Maugerville trial site.

CULTIVAR	QUALITY CHARACTERISTICS*			COMPACTNESS
	LEAFINESS	COLOUR	PUBESCENCE	
Andes	1.0	2.7	1.5	1.6
Ravella	1.0	2.5	2.3	1.4
Siria	1.0	2.6	2.7	1.7
Tavia	1.7	2.7	2.4	2.3
White Rock	1.1	1.9	1.8	2.2
White Top	1.1	2.7	1.8	2.8

*Ranking:

Leafiness	1= no leaves in curd	3= unsaleable
Colour	1= white	4= unmarketable yellow
Pubescence	1= absence of hairs	4= severe
Compactness	1= tight curd	5= excessively loose

CONCLUSIONS: The results of this trial were greatly influenced by the climatic conditions experienced during the 1990 growing season. Cauliflower was more adversely effected than broccoli by the warm dry period experienced in early summer. In addition, the Sussex site was more seriously effected than Sheffield Interval soil which has a greater moisture retention capacity.

Among the broccoli cultivars evaluated at Sheffield, cvs. Improved Comet, Buccaneer and Fieldcrest performed well as early broccoli types. Fieldcrest was noted for maturity but not harvested in order that the interval between pesticide spraying and harvest could be respected. These three cultivars did not perform well at the Sussex site displaying a tendency for either bolting or developing very loose heads. At Sussex, cvs. Goliath, Zeus and Mariner produced earlier harvests of better quality. These results illustrate the variable response of early broccoli cultivars when grown under stressful conditions. The cultivars that showed a tendency to yellow at maturity (Chancellor, Fieldcrest and Buccaneer) should be evaluated again under more typical conditions.

The extensive losses encountered in the cauliflower trial make it difficult to arrive at definite conclusions. Four of eight cultivars did provide reasonable yields at Sheffield however none was exceptional in overall quality. At Sussex, only one of eleven cultivars performed well. At peak season, harvesting was done every three days, however curd quality was lost during the time between tying and cutting, due mostly to high temperatures. Reports from other research stations involved in cauliflower testing indicate that similar problems were encountered during the 1990 season.

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ORNAMENTALS - ORNEMENTAUX

REGIONAL BEDDING PLANT TRIALS

A. W. Currie

ABSTRACT: 24 species of bedding plant cultivars were evaluated during the spring/summer of 1990 at the New Brunswick Horticultural Centre located in Hoyt. Pack and field evaluations were conducted on plant height, diameters of flowers, amount of bloom and trueness to type. From these readings, plants were rated according to scores appointed during the observation periods.

ESSAIS RÉGIONAUX DE PLANTES Ä REPIQUER

Résumé: Vingt-quatre cultivars de plantes à repiquer ont été évalués au printemps et à l'été de 1990 au Centre d'horticulture de Hoyt (Nouveau-Brunswick). Les évaluations de plants en caissettes et de plants en pleine terre portaient sur la hauteur des plants, le diamètre des fleurs, le nombre de fleurs et l'intégrité variétale. À partir de ces indications, les plants ont été classés selon des points attribués pendant les périodes d'observation.

INTRODUCTION: These trials are ongoing cooperative evaluations between all four Atlantic Provinces. The goal each year is to screen new plant material and identify the exceptional cultivars. This enables the producer and the consumer the opportunity to purchase the best plant material available.

Pack evaluations were carried out prior to transplantation (June 7). Field evaluations were carried out on July 30. All plants were grown in 806 plastic containers except geraniums which were in 4 inch pots.

All measurements are in centimeters. Ratings in Table 1 are a total out of 10, in table 2 they are out of 50.

TABLE 1: Pack Evaluation

VARIETY	PLANT HEIGHT	DIA. OF FLOWER	AMOUNT OF BLOOM	BLOOM TRUENESS TO TYPE	FOLIAGE APPEAR.
PANSY					
Jolly Joker	18	5	9	10	10
Padparadja	18	4	10	10	10
Maximum Marine	18	5	10	10	10
GERANIUM					
Elite Pink	12	-	-	-	10
Multibloom White	12	12	8	10	10

Bandit Red	14	-	-	-	10
Ringo Deep Scarlet	15	9.5	1	10	10
Multibloom Bright Rose	16	10	8	10	10
Multibloom Scarlet Eye	12.5	12	10	10	10
Multibloom Lavender	14	11	10	10	10
Multibloom Pink	11.5	11	8	10	10
Elite Cherry	13	-	-	-	10
Elite Scarlet	15	-	-	-	10
Orvit Hot Pink	15	-	-	-	10
White Elite	14	9	1	10	10
Orbit Pink	14	-	-	-	10
Light Salmon	13	9.5	2	10	10
Bandit Deep Salmon	13	8.5	1	10	10
Orbit Deep Salmon	12.5	-	-	-	10
Neon Rose	15	7	1	10	9
Tiffany	14	-	-	-	10
Ringo Deep Red	13	-	-	-	10
Cherry Elite	14	11	1	10	10
Challenge White	13.5	11	9	10	10
Multibloom Salmon	14	8	10	10	10
Multibloom Red	12	10	9	10	10
AAS Freckles	11.5	7.5	2	10	10
Orbit Rose	14	10	1	10	10

SALVIA

Inferno	11	5.5	10	10	10
Empire Dark Salmon	17	5	10	10	10
Blaze of Fire	21	5	8	10	10
Fireball	19	5.5	10	10	10
Scarlet Pimpernel	17	5	9	10	10
Red Pillar	20.5	2.5	3	10	10
Sky and Ice	14	6	10	10	10
Fire and Ice	11	5	10	10	10
Little Tango	11.5	5	10	10	10
Sparkles	13	5	10	10	10
Cleopatra Purple	14	5	10	10	10
White Fire	12	4.5	10	10	10
Empire White	12	4	9	10	10
Cleopatra Salmon	11	5	9	10	10
Carabiniere Scarlet	15	4	6	10	10

Red Hot Sally	14	4	9	10	10
Carabiniere Blue	20	5	8	10	10
Red Pillar	20	2	1	10	10
St. John's Fire	20	5	10	10	10
Violet Flame	16	5	6	10	10
Empire Light Salmon	20	5.5	10	10	10
Carabiniere Red	22	5	4	10	10
Carabiniere White	22	5	10	10	10
Empire Lilac	17	4.5	10	10	10
Carabiniere Orange	17	3	6	10	10
Scarlet Midget	17	4	10	10	10
Cleopatra White	16	5	10	10	10

ALYSSUM

Snow Carpet Select	10	2	10	10	10
Tiny Tim	9	2	10	10	10
New Carpet of Snow	8	2.5	10	10	10
Midnight	5	2	9	10	10
Oriental Night	5.5	3	9	10	10
Royal Carpet	5.5	3	7	10	10
Wonderland Rose	6	2	10	10	10
Snow Cloth	9	2.5	10	10	10
Snow Crystal	9	2.5	10	10	10
Wonderland White	9	2.5	10	10	10
Carpet of Snow	7	2.5	10	10	10
Navy Blue	6.5	3	10	10	10
Snow Drift	10	2.5	10	10	10
Rosie O'Day	5.5	2.5	10	10	10
Easter Bonnet	7	2.5	10	10	10

PETUNIA

Polo Deep Blue	4.5	7	9	10	10
Polo Salmon	6.5	7	9	10	10
Polo White	7	9	10	10	10
Highlight Blue	7.5	8	9	10	10
Velvet Carpet	8	7	10	10	10
Rose Carpet	8	7	9	10	10
Polo Velvet	13	8	9	10	10
Madness White					

Imp	8	9	4	10	10
F1 Polo Salmon	8	7	10	10	10
Highlight Coral	8	8.5	8	10	10
Polo Red	8	7.5	8	10	10
White Carpet	13	8	8	10	10
Carpet Pink	8	7	9	10	10
F1 Flame Carpet	8.5	7	7	10	10
Red Carpet	8	8	7	10	10
Celebrity Blue	15	7	9	10	10
F1 Polo Burgundy Star	13	6	7	10	10
Polo Pink	7	7	8	10	10
Plum Carpet	7	7.5	7	10	10
Madness	7	7	6	10	10
Polo Blue Star	13	6	7	10	10
Ultra Crimson Star	13	10	8	10	10
Madness Rose	6	7.5	5	10	10
Madness Red	6	7.5	6	10	10
Celebrity Red	6	8.5	7	10	10
Madness Coral	6	7	6	10	10
Polo Burgundy Star	6.5	6	4	10	10
Madness Burgundy	5	8	5	10	10
Orchid Daddy	15	10	9	10	10
Purple Pirouette	15	-	-	-	10
Plum Purple	12	7	6	10	10
Madness Plum	11	8	9	10	10
Summer Madness	10	7.5	8	10	10
Sugar Madness	9	8	8	10	10
Celebrity Hot Pink	7	8	7	10	10
Celebrity Salmon	9	8.5	9	10	10
Sheer Madness	7	8	9	10	10
Starlight Joy	9	8	3	10	10
Highlight Carmine	6	8.5	3	10	10
Celebrity White	8	8.5	9	10	10
Rose Parasol	3.5	-	-	-	10

IMPATIENS

Tango New AAS New Guinea	10	-	-	-	10

MARIGOLDS

Disco Flame	9	5.5	9	10	10
Viva	11	5	9	10	10
Disco Red	9	5	9	10	10
Disco Marietta	11	4	9	10	10
Disco Golden Yellow Imp.	10	5.5	10	10	10
Stokes Mini Marietta	7	3.5	9	10	10
Dwarf Stokes Instant Yellow	10	3.5	10	10	10
JVK Burgundy Ripple	11	5	10	10	10
Stokes Dwarf Red Marietta	12	5.5	10	10	10
JVK Cinnabar	15	5	10	10	10
JVK Naughty Marietta	15	5.5	10	10	10
Harris Moran S. Company Laguna Yellow	13	7	10	10	10
Laguna Gold	11	7	10	10	10
AAS Golden Gate	11	6	10	10	10
Olé	13	5	10	10	10
Disco Orange	12	5	10	10	10
Granada Stokes	13	5	10	10	10
Dainty Marietta	14	4.5	10	10	10

AGERATUM

North Sea	8	2.5	2	10	10
Blue Lagoon	8	2.5	4	10	10
Madison	6	2.5	1	10	10
Pacific Improved	9	3	8	10	10
Blue Blazer	13	4	10	10	10
Bavaria	5	-	-	-	10
Blue Danube	7	1	1	10	10
Adriatic Improved	8	2.5	8	10	10
Dwarf Blue Bedder	6	-	-	-	10
Blue Mink	7	-	-	-	10
Ocean Improved	8	2	1	10	10
Gallardia Pulchilla AAS Red Plume	5.5	-	-	-	10

DUSTY MILLER					
Desmond Cineraria Maritima	12	-	-	-	10
Silver Lace	20	-	-	-	10
Silver Feather	18	-	-	-	10
VINCA					
Parasol AAS 1991	3	-	-	-	10
Pretty In Rose AAS 1991	2	-	-	-	10
Pretty In Pink AAS 1991	2	-	-	-	10
TORENIA					
F2 Clown Mixture AAS	4	3	1	10	10
ZINNIA					
Scarlet Splendor 1990 AAS	6	No blooms	-	-	10
COSMOS					
Ladybird Scarlet	4	No blooms	-	-	10
CELOSIA					
AAS New Look 1988	2	No blooms	-	-	10
COREOPSIS AAS					
Early Sunrise	.5	No blooms	-	-	10

TABLE 2: Field Evaluation

Variety	Plant Height	Plant Spread	Bloom Size	Rating	Source
PETUNIA					
Polo Red	15	21	6	39	B
Celebrity Salmon	16	33	7	39	S
Celebrity White	20	30	7	39	S
Flame Carpet	19	31	6	39	B
Ultra Crimson Star	16	32	9.5	39	A
Orchid Daddy	16	30	9.5	39	A
Polo Salmon	15	21	6	39	A
Highlight Carmine	12	28	7.5	38	B
Madness Pink	15	30	6.5	38	B
Coral Madness	14	32	7	38	B
Summer Madness	15	28	6	38	J
Madness	19	28	6	38	B
Polo Pink	18	31	7	38	S
Purple Pirouette	18	30	9.5	37	A
Madness Red	17	27	7	37	J
Sugar Madness	18	30	7	37	B
Plum Purple	20	37	6	37	S
Madness White Imp.	21	30	6	37	B
Plum Carpet	14	21	5	37	S
Celebrity Red	15	38	6	36	S
Polo Velvet				36	S
Highlight Coral	16	31	8	36	S
Highlight Blue	19	31	8	36	S
Polo Blue Star	21	24	5	36	S
Celebrity Blue	23	28	6	36	S
Red Carpet	11	25	6	36	S
Polo Salmon	18	28	6.5	36	S
Rose Carpet	12	29	6	36	S
Pink Carpet	17	27	6	36	S
Celebrity Pink				36	B
Madness Plum	18	25	6	36	B
Starlight Joy	19	28	7	36	B
Rose Parasol	10	25	6	36	B
Burgundy Madness	18	30	7	35	B
Sheer Madness	16	30	6	35	S
Polo Red	20	33	6	35	B

Polo White	20	24	6	35	S
Polo Burgundy Star	13	26	5	35	S
White Carpet	18	23	6	35	S
Polo Burgundy Star	13	26	5	35	A
Celebrity Hot Pink	15	31	7	35	S
Velvet Carpet	15	22	6	33	S
Polo Deep Blue	12	17	5	33	S

DUSTY MILLER

Diamond Cineraria	18	30		20	B
Silver Feather	21	17		18	JVK
Silver Lace	25	17		18	S

Pansy

Maxim Marina	13	20	5	34	A
Padparadja	8	18	3	32	A
Jolly Joker	7	16	4	25	A

VERBENA

Novalis Deep Blue	9	11	5	37	A
Sandy White	13	11	5	32	A

VINCA

Pretty In Pink	5.5	10	4	30	A
Parasol	6	11	4	29	A
Pretty in Rose	5	13.5		18/20 no bloom	A

CELOSIA

Pink Castle	14	20	1.5	29	A
New Look	17	25		19 no bloom	A

IMPATIENS

Tango	9	19	5	37	A

SANVITALIA

Mandarin Orange	15	35	2	36	A
DIANTHUS					
Telstar Picotee	14	22	3	36	A
TORENIA					
ACHILLEA					
Summer Pastels	11	25		18no bloom	A
MARIGOLD					
Mini Marietta	8	20	3	39	S
Disco Flame	8	15	4	39	B
Viva	15	25	4.5	39	B
Iguana Yellow	15	23	6	39	B
Iguana Gold	11	18	5	39	B
Naughty Marietta	23	23	4.5	39	JVK
Golden Gate	12	23	5	38	B
A Instant Yellow	14	17	4	38	S
Disco Yellow				38	B
Olé	13.5	20	5	38	B
Burgundy Ripple	22	27	4	38	JVK
Disco Red	14	19	4.5	37	B
Cinnabar	26	38	5	37	JVK
Dainty Marietta	21	30	4	37	JVK
Disco Golden Yellow	13	17	5	37	B
Red Marietta	16	24	6	36	S
Granda	11	14	5	36	S
Disco Marietta	17	23	5	35	B
ZINNIA					
Scarlet Splendor	30	29	12	40	A
GALLARDIA					
Red Plum	14	25	6	34	A

COSMOS					
Ladybird Scarlet	20	30	5	32	A
CHRYSANTHEMUM					
Snow Lady	8.5	18	3.5	27	A
COREOPSIS					
Early Sunrise	15	18		18 no bloom	A
BASIL					
Purple Ruffles	12.5	15		20 no bloom	A
SNAPDRAGON					
Princess White with Purple Eye	16	24	6	32	A
AGERATUM					
Ocean Improved	10	18	3	40	S
Blue Blazer	22	24	3	40	B
Pacific Improved	13	23	4	39	S
Blue Lagoon	13.5	25	2.5	38	S
Adriatic Improved	12	24	2	38	S
Madison	11	16	5	37	S
North Sea JVK	11	18	3	37	
Bavaria	14.5	23	2.5	37	S
Dwarf Blue Bedder	15	26	3	37	S
Blue Danube	13	21	5	36	S
Blue Mink JVK	15	25	4.5	36	
SALVIA					
Cleopatra Purple	15.5	14	4.5	35	B
Red Hot Sally	15	19	4.5	35	B
Carabiniere Blue	23	27	4.5	34	B
Empire Light Salmon	21	24	4	34	B

Scarlet Pimpernel	17	20	5	34	B
Carabiniere Scarlet	17	21	4.5	34	JVK
Carabiniere Red	26	23	4	34	B
Red Pillar	29	20	5	34	B
Empire Red					
Violet Flame	25	21	5	33	B
Fireball	17	23	5	33	B
Blaze of Fire	16	20	5	33	B
St. John's Fire	25	25	4.5	33	S
Little Tango	13	19	5	32	JVK
Fire & Ice	10	17	4	32	S
Scarlet Midget	20	18	4	32	JVK
Empire White	12	15	4.5	31	B
Carabiniere White	16	15	4.5	30	B
Carabiniere Orange	21	19	4	30	B
Sky & Ice	17	18	5.5	29	S
Empire Dark Salmon	15	17	4	29	B
White Fire	12	21	4.5	29	B
Cleopatra Salmon	9	13	4	28	B
Inferno	8	11	4	27	B
Cleopatra White	12	13	4.5	27	B
Sparkler	9	12	4	26	JVK

ALYSSUM

Snow Drift	13	23	2	38	B
Midnight	8	26	2	37	JVK
Oriental Night	8	20	2	37	S
Wonderland Rose	9	20	2	37	S
New Carpet of Snow	8	26	1.5	35	B
Rosie O'Day	7	14	2	34	S
Carpet of Snow	7	22	2	33	S
Easter Bonnet	8.5	20	1.5	40	JVK
Snow Crystal	12	23	2	40	S
Snow Cloth	12.5	31	2	40	S
Tiny Tim	11	14	1.5	40	B
Snow Carpet Select	11	22	2	40	S
Wonderland White	11	22	1.5	40	B

Navy Blue	12	25	2	39	S
Royal Carpet	9	20	2	39	S

GERANIUM

Elite Scarlet	17	30	10.5	40	J
Cherry Elite	16	29	10	40	J
Multibloom Bright Rose	16	24	10	39.5	S
Multibloom Mixture	13	21	10	39	B
Katie	15	27	14	39	B
Kim	16	30	12	39	J
Freckles	15	25	9	39	J
Carnival	12	22	9.5	39	B
Ringo Deep Scarlet	23.5	32	11	39	B
Bandit Red	19	29	11	39	J
Orbit Red				39	J
Orbit Hot Pink	19	28	10	39	J
Bandit Deep Salmon	17	28	8.5	39	J
Multibloom Red	10	18	9	38.5	J
Ringo Deep Red	16	29	11	38	S
Orbit Deep Salmon	15	25	9.5	38	J
Neon Rose	15	27	10	38	B
Orange Appeal	15	23	9.5	38	B
Fame	18	30	13	38	S
Light Salmon	14	26	9	37	S
Elite Pink	13	24	9	37	J
Tiffany	22	31	10	37	S
Elite White	18	26	10	36	J
Snow White	12	22	10	36	B
Misty	13	22	11	36	B
Multibloom Scarlet	12	23	10	36	J
Multibloom Scarlet Eye	12	21	9	36	J
Multibloom Salmon	10	24	8	35	J
Simone	10	35	7	34	B
Multibloom White	12	23	7	34	J
Multibloom Lavender	14.5	24	8.5	34	J
Challenge White	14	22	8.5	34	S
Multibloom Pink	10	23	8	31	j

S - Stokes
B - Ball Superior Ltd.
J - J.V.K. Ltd.
A - All American Selections

COMPARISON OF CONTROLLED RELEASE "NUTRICOTE" FORMULATIONS 18-6-8(TOTAL):T100 AND 16-10-10:T100 ON SPIRAEA BUMALDA 'ANTHONY WATERER' AND THUJA OCCIDENTALIS 'EMERALD'

By
Garth Nickerson

ABSTRACT: The effects of two controlled release fertilizer formulations of Nutricote(18-6-8 T100 and 16-10-10 T100), on two species of container grown ornamental plants(Thuja occ. 'Emerald' and Spiraea xbumalda 'Anthony Waterer') was studied. The formulation of Nutricote 18-6-8Total:T100/16-10-10 T40(3:1 ratio) @ 7 kg/m3 produced the greatest growth in Spiraea. Nutricote 18-6-8Total:T100/16-10-10 T40(3:1) provided a better growth response in Thuja @ 3, 5, and 7 kg/m3 than corresponding rates 16-10-10 T100/16-10-10 T40. Nutricote 16-10-10 T100 @ 5kg/m3 exhibited the greatest growth in Thuja.

COMPARAISON DE DEUX APPLICATIONS CONTRÔLÉES DE NUTRICOTE 18-6-8(TOTAL):T100 ET 16-10-10:T100 SUR LES SPIRAEA X BUMALDA "ANTHONY WATERER" ET THUJA OCCIDENTALIS "ÉMERAUDE"

Résumé: On a étudié les effets de deux applications fertilisantes contrôlées de Nutricote (18-6-8 T100 et 16-10-10 T100) sur deux espèces de plantes ornementales (**Thuja occidentalis "Émeraude"** et **Spiraea x bumalda "Anthony Waterer"**). L'application de nutricote 18-6-8 Total:T100/16-10-10 T40 (rapport de 3:1) à raison de 7 kg par mètre cube a engendré la plus grande croissance chez la Spiraea x **bumalda**. Pour le Thuja occidentalis, on a obtenu une meilleure croissance avec le Nutricote 18-6-8 Total :T100/16-10- 10 T40 (rapport de 3:1) à raison de 3, 5 et 7 kg par mètre cube qu'avec des taux correspondants de Nutricote 16-10-10 T100/16- 10-10 T40. L'application de 5 kg par mètre cube de Nutricote 16- 10-10 T100 a favorisé la plus grande croissance chez le Thuja occidentalis.

INTRODUCTION: The use of controlled release fertilizers in the container production of nursery stock is an essential component of successful nursery growing practices. There are several types of trade formulations available and recommended rates of application tend to vary depending on the species grown and the geograpical location of the intended nursery site. "Nutricote" is one of the most common CR fertilizers in use and is reputed to offer the best controlled release fertility for most nursery plants. The objective of this experiment was to test two formulations of Nutricote Type100 at four different rates on two common species of nursery stock to see if an optimum fertility rate could be determined.

METHODS AND MATERIALS: During the first week of June, 1990, 2 yr. field grown plants of Thuja occ. 'Emerald' and Spiraea xbumalda 'Anthony Waterer' were potted up in 6 l black poly containers. The potting media used was an 8:4:1 mixture of bark:peat:sand. Fertilizer formulations used in the treatments were Nutricote 16-10-10 Type100(100 day release @ 25 C), Nutricote 16-10-10-Type 40 and Nutricote 18-6-8 Total Type100 . The treatment combinations used in the experiment are outlined in table 1.

Table 1. Treatment Rates and Ratios using Nutricote 16-10-10T100, Nutricote 16-10-10T40, and Nutricote 18-6-8'Total'T100. Treatment ratios are 3:1.

TREATMENT	RATE kg/m3
1) 16-10-10T100 + 16-10-10T40	3
2) " + "	5
3) " + "	7
4) 16-10-10T100 only	5
5) 18-6-8TotalT100 + 16-10-10T40	3
6) " + "	5
7) " + "	7
8) 18-6-8T100 only	5
9) Control #1- 20-20-20 only	
10) Control #2- 18-6-8T100 + 14-14-14T40	5

All treatments were amended with 3 kg/m3 of dolomitic lime and 1.0 kg/m3 of super phosphate(0-20-0). Nutritrace micronutrients were added only to treatments with 16-10-10-T100 and to control #1. Treatments using 18-6-8Total-T100 had no Nutritrace added as micronutrients are incorporated in the fertilizer.

Control #2 was used as a comparison treatment. It was a mix of Nutricote 18-6-8-T100 and Nutricote 14-14-14T40 in a ratio of 3:1. It was amended with: 1.0 kg dolomitic lime, 1.0 kg gypsum, 1.0 kg 0-20-0 and 0.5kg Nutritrace per m3. Water soluble fertilizer, Peter's 20-20-20, was applied once per week @ 200 ppm to all treatments. An additional application was made @ 100 ppm to control #1 once per week.

The experiment was set up as a randomized split block design with all treatments having 4 plants replicated 5 times for a total of 20 plants per treatment.

For plants of Thuja, height and width measurements were determined initially two weeks after potting and again 2 months later at the termination of the experiment. The growth index(Height+Width/2) was calculated for initial and final measurements of each plant and the difference between them was used for the final analysis.

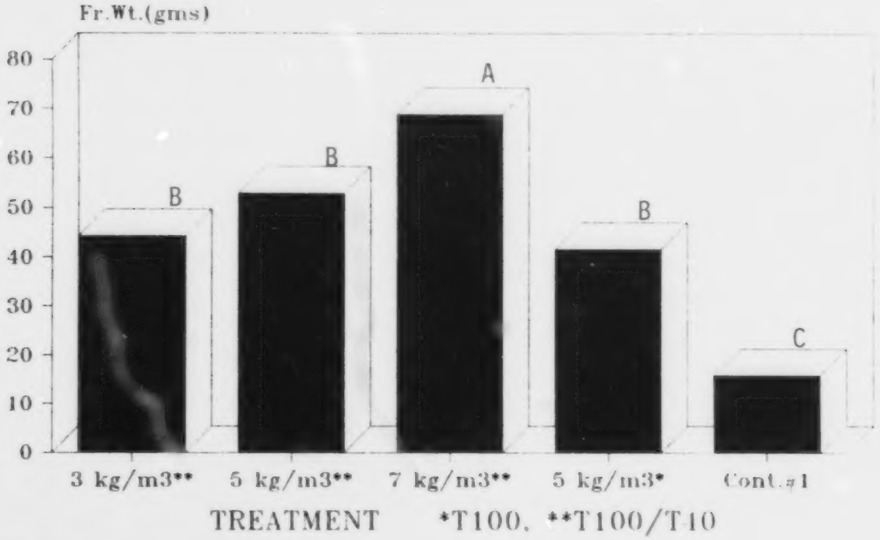
For Spiraea, all plants were cut back to 15cm 2weeks after potting. and cut back to the same height at the end of the trial. Total fresh weight gain was used in the final analysis.

The parameters measured for each plant species was analysed separately using a one way analysis of variance and an LSD(.05) to separate the means.

RESULTS & DISCUSSION: Plants of Spiraea responded quite differently than Thuja to the same fertilizer treatments. This may be due to a variation in physiological response between the two species or it may be attributable to the different growth parameter that was measured.

For Spiraea, all treatments demonstrated a significantly greater response than the control(Fig.1). The 7 kg rate of 16-10-10T100/T40 showed the greatest response and was significantly greater than all other lower rate treatments. The 3 and 5 kg T100/T40 rates both showed greater growth than the 5kg T100 rate. This may indicate that with a quicker growing species like Spiraea, Nutricote 16-10-10T100/T40 @ 7 kg/m3 provides the greatest fresh weight gain.

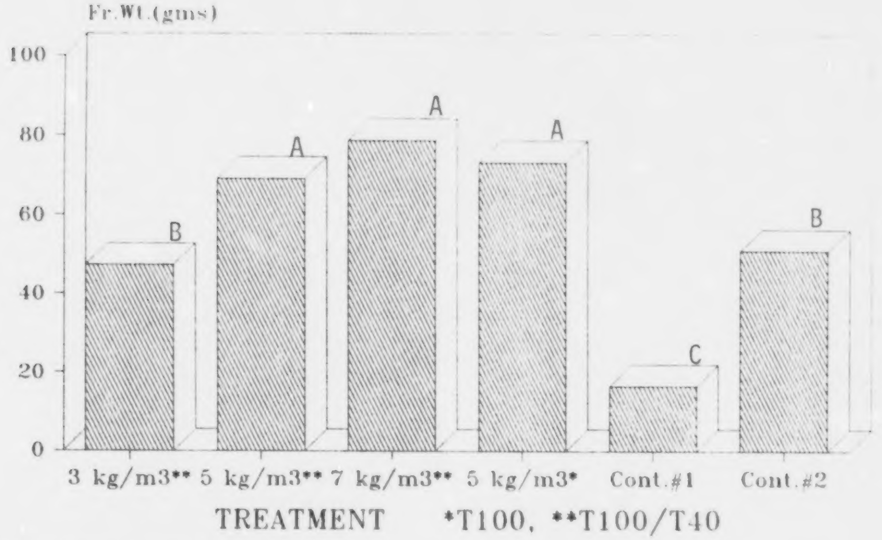
Fig.1 Comparison of Rate and Ratio of
Nutricote 16-10-10 on
Spiraea 'Anthony Waterer'



Diff. Letters denote Sig. Difference

All treatments using an 18-6-8 T100 formulation demonstrated a significantly greater growth increase than the control #1(Fig.2). The 7 kg rate of T100/T40 had the greatest response of all treatments but was not sig. greater than the 5 kg T100/T40 or the 5 kg T100 rates. The 7 and 5 kg rates of 18-6-8T100/16-10-10T40 and the 5 kg 18-6-8T100 had sig. greater growth than Cont.#2;5 kg 18-6-8T100/14-14-14T40. The 7 kg rate of Nutricote 18-6-8T100/16-10-10T40 stimulated the greatest fresh weight gain in Spiraea.

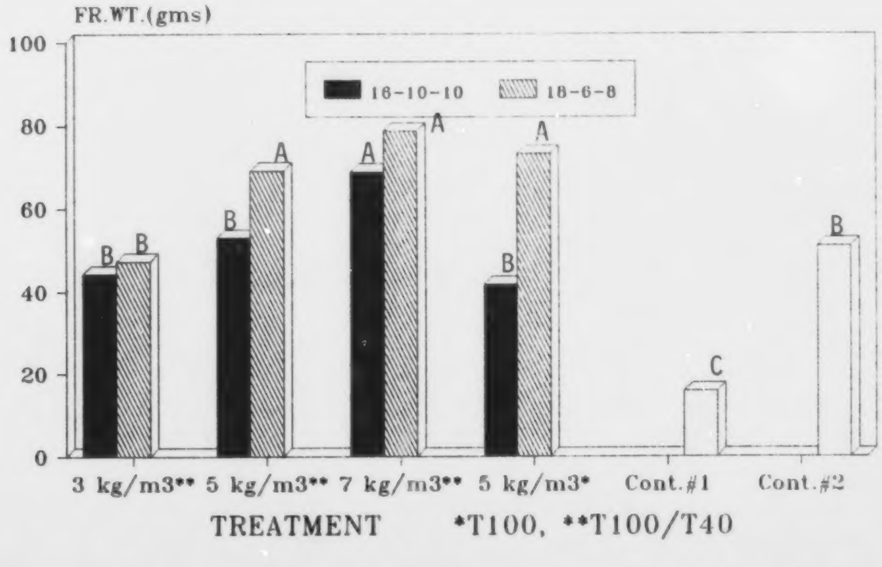
Fig.2 Comparison of Rate & Ratio of Nutricote 18-6-8 on Spiraea 'Anthony Waterer'



Diff. letters denote Sig. Difference

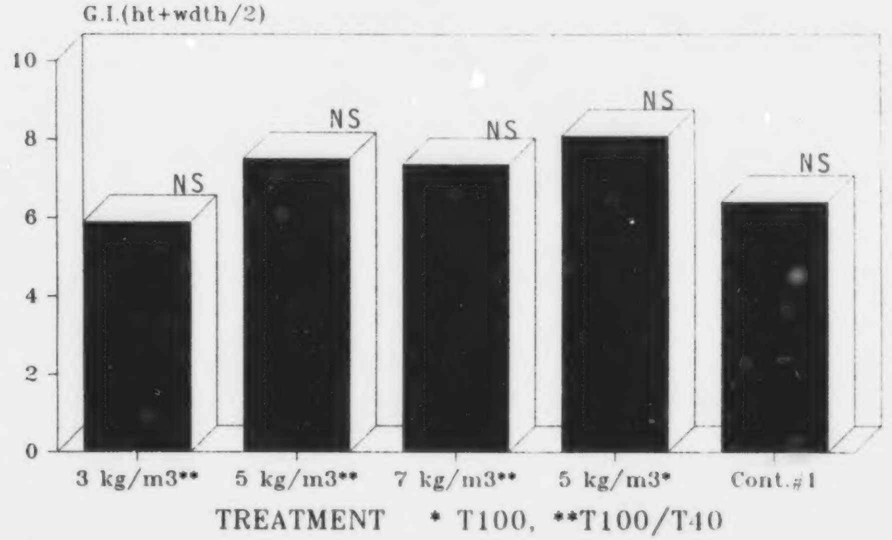
Comparing the two formulations, Nutricote 18-6-8T100 shows a greater growth response than Nutricote 16-10-10T100 used alone or in combination with Nutricote 16-10-10T40. At the 5 kg level the difference is significant(Fig.3). Nutricote 18-6-8T100/T40 @ 7 kg/m3 provides the best growth response in Spiraea.

Fig. 3 Comparison of Rate and Ratio of Nutricote 16-10-10 & 18-6-8 Spiraea 'Anthony Waterer'



The response of Thuja occ. 'Emerald' to the treatments using 16-10-10 did not demonstrate any significant difference from the control treatments(Fig.4). This is not what would be expected. Struger and Lumis(1) in a study comparing various rates and ratios of Nutricote 16-10-10T100 and T40 on Thuja occ. Pyramidalis'demonstrated that a rate of 7 kg/m3 of 16-10-10T100/T40 in a 3:1 ratio performed significantly better than treatments using 7kg/m3 16-10-10T100 alone or a 5 kg/m3 rate T100/T40.
Possibly, this difference in response between the two experiments may be due to the use of different growth parameters. The use of a growth index(height + Width/2) is not as accurate in measuring growth response as is the measurement of fresh or dry weights which take into account the densities of plants. Also, the use of a water soluble fertilizer applied to all treatmeants could have narrowed the difference in growth responses.
Compared to the cont.#1 which used 20-20-20 only, all treatments had greater growth responses except the 3 kg 16-10-10T100/T40 rate. The 7 kg rate had less growth than both the 5 kg rates of 16-10-10T100.

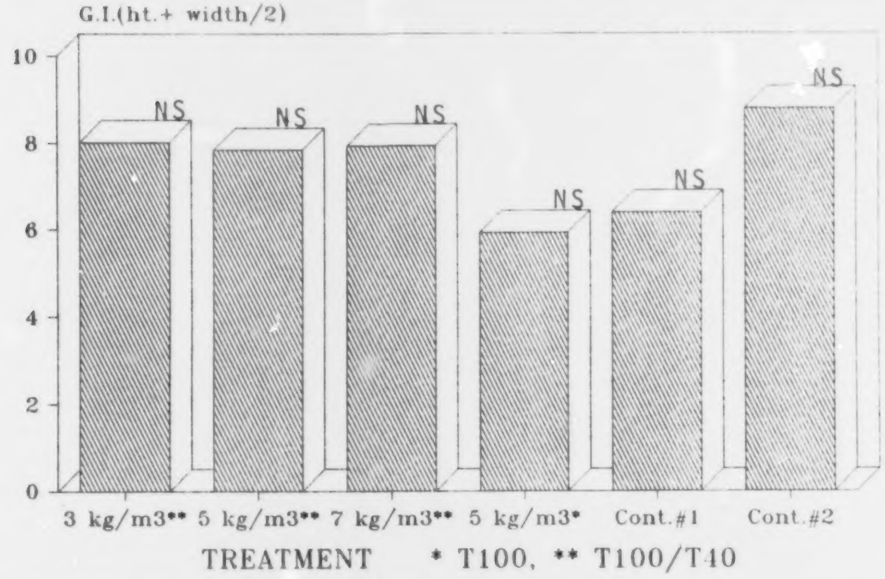
Fig.4 Comparison of Rate and Ratio of Nutricote 16-10-10 on Thuja 'Emerald'



NS denotes non sig. difference(LSD.05)

The response of Thuja to treatments using 18-6-8T100/T40 was quite uniform with little growth response variation between the 3, 5, and 7 kg/m3 treatments(Fig.5). They were all greater than the Cont.#1 and the 5 kg T100 treatment, however, it is unusual that the 3 kg rate growth response is slightly higher than both the 5 and 7 kg rates.
Cont.#2 which used 18-6-8T100/14-14-14T40 @ 5 kg/m3 showed the greatest response of all the treatments.

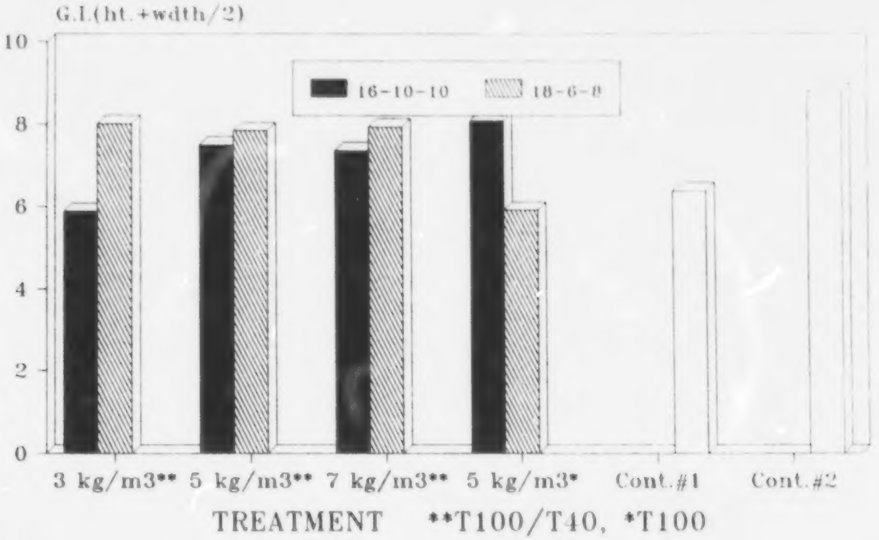
Fig. 5 Comparison of Rate and Ratio of Nutricote 18-6-8 on Thuja 'Emerald'



NS denotes non sig. difference(LSD.05)

CONCLUSIONS: For Spiraea, all the rates used(3,5, & 7kg/m3) of both 18-6-8 and 16-10-10 T100 formulations of Nutricote provided a significantly greater response than the control(20-20-20 only). The 18-6-8 T100 exhibited better performance than the 16-10-10 T100 formulation at all rate and ratio levels used(Fig.3). The greatest growth gain was demonstrated by the use of Nutricote 18-6-8(Total)T100/16-10-10T40 at 7 kg/m3.

Fig.6 Comparison of Rate & Ratio of
Nuticote 16-10-10 & 18-6-8 On
Thuja occ. 'Emerald'



For Thuja the treatment differences were non-significant and generally unconclusive. Observations indicate that on average, Nutricote 18-6-8T100/16-10-10T40 at 3, 5, and 7kg/m3 provide a better growth response on Thuja than Nutricote 16-10-10T100/T40 used at similar rates(Fig.6). None of the treatments produced as great a growth response as control#2 - a 5 kg rate of 18-6-8T100/14-14-14T40. A 5 kg/m3 rate of 16-10-10T100 had the next largest response.

REFERENCES: 1. Struger, S. and G. Lumis. 1988. A Study Of Nutricote 16-10-10, Rate and Ratio. Published in Horticulture Review, June 1, 1990. Pgs. 6-7.
2. Wright, R.D. and A.X. Niemiera. 1986. Nutition of Container-Grown Woody Nursery Crops. Hortcultural Review, Vol. 9, Pgs.75-95.

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CEREAL CROPS & FORAGES
CÉRÉALES & FOURRAGES

GRAIN CORN HYBRID EVALUATION

Walter Brown & A.O.M.Smith

ABSTRACT: Grain corn hybrids evaluated at Sussex in 1990 had good grain yields as well as good dry matter accumulation. The top yielding hybrid was Pioneer 3921 at 8.53 tonne/Ha. at 15.5 % moisture. 3921 also had a higher number of ears per plant at 1.29. K020 had the highest dry matter however it yielded lower because of maturing earlier. This season favoured the longer season hybrids because of the high heat units accumulated and the late date of the first killing frost.

ÉVALUATION D'HYBRIDES DE MAÏS-GRAIN

Résumé: Les hybrides de maïs-grain évalués à Sussex en 1990 ont donné de bons rendements de grains et un bon taux de matière sèche. L'hybride le plus productif a été le Pioneer 3921; son rendement était de 8,53 tonnes par hectare et le taux d'humidité des grains était de 15,5 p. 100. Cet hybride comptait aussi le plus grand nombre d'épis par plant (1,29). Par contre, l'hybride K020 avait la plus forte teneur en matière sèche, mais son rendement était inférieur à cause d'une maturité trop précoce. La saison a été favorable aux hybrides à maturation prolongée à cause du grand nombre de degrés-jours accumulés et de la date tardive des premières gelées fatales.

INTRODUCTION: Corn acreage in New Brunswick appears to be holding steady. As alfalfa acreage continue to increase on dairy farms in New Brunswick there will be an increased demand for high energy feeds to complement the higher protein of alfalfa. Corn and in particular grain corn has the potential to supply some of this high energy feed.

In 1990 a grain corn trial was planted in Sussex to complement the Silage Corn Hybrid Evaluation Trial already in place. 17 grain corn hybrids were obtained from the Atlantic Corn Committee for planting in Sussex.

MATERIALS AND METHODS: 17 grain corn hybrids were seeded on May 28,1990. Plot design was randomized block with 4 replications. 66 seeds were planted in 7.59 meter rows with .76 meter row widths. At the 5 leaf stage plants that were counted and the hybrids were thinned to 33 plants per row. Fertility was 225 Kg/Ha 5-10-30 broadcast prior to planting, 280 Kg/Ha 18-46-0 band at seeding, and 200 Kg/Ha 34-0-0 topdress on June 29. 28 Kg/Ha of Magnesium was applied on June 1 to supplement a low soil Magnesium content. Weed control was 1 L/Ha Round-up + Frigate prior to tilling plus .6 L/Ha of Banvel on June 11. Prior to harvest all hybrids were rated as to Corn Stem Boer damage. Heat units were recorded at the sight with 2735 CHU'S being accumulated by Sept. 30. Plots were harvested on Oct. 18.

RESULTS AND DISCUSSION: Seeding of the plot was delayed approximately 18 days due to excessive rain and cold temperatures in early May. High CHU accumulation through July and August allowed most hybrids to achieve excellent yields and dry matter accumulation at harvest.

TABLE 1: YIELD & AGRONOMIC DATA ON GRAIN CORN GROWN AT SUSSEX 1990

Hybrid	% Germ.	% Broken Stalks	Grain Yield 15.5 % moist.	Grain Moist.	# Ears Plant
K020	87.1	22	4.83 F	25.13	0.97
N0565	85.6	21	7.20 BC	26.59	1.04
Co-op 2335	92.8	30	7.01 BC	28.65	0.97
G-4017	80.7	21	6.68 CD	28.81	1.06
Co-op 2325	80.7	23	7.67 B	29.18	1.03
K610 *	90.2	9	6.76 CD	29.38	1.01
3979 +	86.7	11	7.62 B	30.51	1.05
DK-235 *	82.2	22	7.10 BC	30.60	1.05
X9C11	89.0	15	7.20 BC	31.10	0.98
K030	87.9	16	5.77 E	31.50	0.96
HL-2219 +	79.6	19	7.81 AB	31.98	0.94
DK-24 +	81.8	25	7.20 BC	33.06	1.05
G-4083 *	82.2	18	5.93 DE	33.17	0.95
3954 +	85.2	11	7.52 BC	33.20	1.05
DK T778	83.3	21	7.27 BC	33.57	0.95
PK 89X1001	82.2	7	7.18 BC	35.24	0.99
3921	86.4	3	8.53 A *	35.68	1.29
LSD(.05)	11.00	10.13	0.84	2.12	8.99
CV (%)	9.12	41.22	8.45	4.59	6.41

* MEANS WITH THE SAME LETTERS ARE NOT SIGNIFICANTLY DIFFERENT

CONCLUSIONS: All hybrids could have been harvested for High Moisture Corn and some of the dryer hybrids were well within a dry matter level where they could be dried down for Dry Corn. This was an ideal year for later corn hybrids because even though May was wet and cold there was a good accumulation of CHU'S and the killing frost was delayed a full month until October 4th.

ACKNOWLEDGMENTS: Thanks is extended to Harold Crowe for providing the sight for the 1990 Grain Corn Hybrid Evaluation as well as preparing the soil.

REGIONAL CORN SILAGE HYBRID EVALUATION TRIALS

Walter Brown & A.O.M. Smith

ABSTRACT: Corn hybrids evaluated for silage production had good dry matter and yields in 1990. Bishop 30-30, a longer season hybrid had the highest yield at 15.47 Tonne/Ha. of dry matter and a dry matter % of 46.3. Corn heat units at the sight was 2735, an increase of 163 over the normal corn heat units for Sussex.

ÉVALUATION RÉGIONALE D'HYBRIDES DE MAÏS D'ENSILAGE

Résumé: Les hybrides de maïs d'ensilage évalués en 1990 avaient une bonne teneur en matière sèche et présentaient de bons rendements. Le Bishop 30-30 est un hybride à maturation prolongée, et son rendement était le plus élevé avec 15,47 tonnes de matière sèche par hectare et une proportion de matière sèche de l'ordre de 46,3 p. 100. Le nombre de degrés-jours enregistrés pour le maïs sur place était de 2 735, soit 163 degrés-jours de plus que le nombre habituel établi pour le maïs à Sussex.

INTRODUCTION: The Regional Hybrid Evaluation Trial in Sussex is conducted in co-operation with a number of sights through-out Atlantic Canada. Corn Hybrids are evaluated for Silage production using data from 3 locations in New Brunswick, 1 in Prince Edward Island, and 3 in Nova Scotia. The data from these trials is used to add or delete corn hybrids recommended for Atlantic Canada in Publication 140.

MATERIALS AND METHODS: 17 corn hybrids were seeded at a sight in Sussex on May 28,1990. Plot design was randomized block with 4 reps. 66 seeds were planted in 7.59 meter rows with .76 meter widths. At the 5th. leaf stage plants that emerged were counted and the hybrids were thinned to 33 plants per row. Fertility was 225 Kg/Ha 5-10-30 broadcast prior to seeding, 280 Kg/Ha 18-46-0 band at seeding, and 200 Kg/Ha topdress on June 29th. 28 Kg/Ha of Magnesium was applied on June 1st. to supplement a low soil Magnesium content. The field received 1 L/Ha of Round-up + Frigate prior to tilling plus .6 L/Ha of Banvel on June 11th.
Prior to harvest all hybrids were rated as to Corn Stem Bore damage. Corn Heat Units were recorder at the sight with 2735 CHU'S being accumulated by Sept. 30th. Killing frost occurred on October 4th and plots were harvested on Oct. 16th.

RESULTS AND DISCUSSION: Seeding at the plot sight was delayed approximately 18 days due to excessive rain and cold temperatures in May. However high CHU accumulation through July and August allowed most Hybrids to achieve an excellent yield and good dry matter accumulation by harvest.

Results of trial data accumulated at Sussex is forwarded to the co-ordinator of the Atlantic Corn Hybrid Evaluation Trials where it is compiled with data from the other sights. A list of corn hybrid that is equal or superior to standard early and late hybrid for the region is published each year from this data.

Final analysis of data accumulated in 1990 will be used to publish Publication 140 which will contain Recommended Corn Hybrids for the Atlantic Region for 1991. Table 1 is data from our sight in Sussex.

CONCLUSIONS: Dry matter ranged from the wettest hybrid at 37.2 % to the driest being 46.3 %. Bishop 30-30, a hybrid considered to be a long season hybrid had the highest performance index for Sussex at 111.9. Corn Heat Units accumulated in 1990 were 2735. These are higher then the normal CHU'S for Sussex of 2572 by 163 units.

ACKNOWLEDGMENTS: Thanks is extended to Harold Crowe for providing the sight for the 1990 Regional Corn Hybrid Evaluation.

TABLE 1: AGRONOMIC DATA FROM REGIONAL CORN HYBRID EVALUATION TRIAL SUSSEX 1991.

Hybrid		Germ.%	% broken stock	Dry Matter	D.M.YLD T/Ha.	Perform. Index
Bishop 30-30	+	92	29	46.3	15.47	111.9
Bishop 30-30z	.	81	21	43.7	16.02	105.7
Pickseed 2444	*	82	7	43.3	12.80	104.6
Co-op 6312	.	87	27	41.8	12.57	101.2
DK-331(DeKalb)	.	90	18	41.6	14.99	100.7
DK-291(DeKalb)	.	83	8	41.4	10.97	98.3
K730 (Pride	*	86	16	41.4	10.49	94.0
3957 (Pioneer)	+	89	30	41.0	13.21	99.2
DK-291z(DeKalb)	.	84	8	41.0	12.44	99.2
3921 (Pioneer)	.	83	4	40.5	14.22	97.8
3957z(Pioneer)	.	91	23	39.8	12.66	96.3
G-4017 (CG)	.	89	26	39.7	10.81	96.0
PX 9021	+	86	20	39.1	10.34	92.7
3979 (Pioneer)	.	89	9	38.4	12.73	92.9
G-4083z (CG)	.	88	26	38.4	11.87	92.9
X9C11 (Pioneer)	.	89	21	37.9	10.28	91.6
G-4083	*	86	26	37.2	10.19	89.9
Grand Mean		87	19	40.7	12.47	
LSD(5%)		9	13	3.2	1.52	
C.V. (%)		7.2	47.6	5.4	8.4	

+ Late Standard
* Early Standard

SOYBEAN CULTIVAR STUDY SUSSEX 1990

Walter Brown & A.O.M. Smith

ABSTRACT: 8 cultivars of soybean were planted in Sussex on June 5 1990 to evaluate yield and dry matter at harvest. Seeding rate was at 180 Kg/Ha which, due to varying seed size, gave a wide range of plant populations. Yields of 6 cultivars were not significantly different and dry matter of all varieties at harvest were with in the range of safe storage with some aeration.

ÉTUDE DE CULTIVARS DE SOJA À SUSSEX (1990)

Résumé: Le 5 juin 1990, on a planté huit cultivars de soja à Sussex pour évaluer leur rendement et leur teneur en matière sèche au moment de la récolte. Le taux d'ensemencement s'établissait à 180 kg par hectare, mais la taille variable des graines a produit des populations végétales très diversifiées. Les rendements de six cultivars n'étaient pas beaucoup différents et, à la récolte, le taux de matière sèche de toutes les variétés était suffisamment élevé pour permettre un entreposage sans risque moyennant une certaine aération.

INTRODUCTION: At various times throughout the past 10 years soybeans have been included in trial work carried on in the Southern Region of New Brunswick. Due to a number of reasons yields and dry matter were never achieved to continue the trials. In 1990 work in short season soybean cultivars carried on by Peter Scott and Robert Walton a number of varieties that may have potential in the Southern Region were identified.

MATERIALS AND METHODS: 8 soybean cultivars were planted in a 4 replicate RCB at Sussex on June 5,1990. Fertility was 250 Kg/Ha of 17-17-17 with a pH of 6.2. Seeding rate was 180 Kg/Ha. Weed control was Round-up the previous fall and Lorox at 450 gm. of product per Ha. on June 11,1990. Plots were harvested using a Hege 125B plot combine on October 17,1990.

RESULTS AND DISCUSSION: Yields were very good on all cultivars although there was minimal losses by using the plot combine to harvest plots. Dry matter levels were very encouraging with Maple Amber being lowest at 14.2 % and Bicentennial the highest at 20.0 %. Because seeding rate was 180 Kg/Ha and not on viable kernels, plant populations tended to fall into a very wide range. Plant population appeared to have little or no influence on yields.

TABLE 1: YIELD & AGRONOMIC DATA ON SOYBEAN CULTIVARS TESTED AT SUSSEX IN 1990.

Cultivar	Yield T/Ha(15 %m)	Plants /sqm.	100 seed wt.(g)	Dry Matter
Maple Glenn	3.92 A *	66.0	8.33	18.1
Maple Arrow	3.78 AB	61.5	7.72	16.7
KG 30	3.68 AB	99.0	8.55	19.6
Apache	3.65 AB	75.5	8.11	16.9
Baron	3.65 AB	82.0	8.23	19.3
Bicentennial	3.60 AB	61.5	8.06	20.0
Maple Amber	3.49 B	81.0	8.11	14.2
KG 20	3.47 B	77.5	8.31	18.4
LSD(.05)	0.34	16.400	.89	
CV (%)	6.36	14.777	.36	

* YIELD MEANS WITH THE SAME LETTER ARE NOT SIGNIFICANTLY DIFFERENT.

CONCLUSIONS: Yields of all the soybean cultivars looked good with no significant difference in 6 of the varieties. Although seeding date was later then ideal, a good accumulation of Heat Units in July and August probably compensated for this. The dry matter at harvest was either in the range for safe storage (14.2%) or in the area that the soybeans could be stored safely with aeration (20%).

ACKNOWLEDGMENTS: Thanks is expressed to George Walker for supplying and preparing the land for these trails. Also to Peter Scott for supplying seed and guiding in cultivar choices.

WINTER WHEAT PRODUCTION MANAGEMENT STUDY - SUSSEX 1990

D.F. Walker and A.O.M. Smith

ABSTRACT: Ten winter wheat cultivars were planted at Sussex on September 6, 1989 with four levels of management applied during the growing season. There was no significant difference in winter survival, thousand kernel weight (T.K.W.), kernels/head, plant population and heading date between management levels. Treatments did cause a significant difference in yield, lodging, plant height and head population. There was a significant difference between cultivars in yield, T.K.W., kernels/head, lodging, plant height, winter survival and heading date.

ÉTUDE SUR LA PRODUCTION DE BLÉ D'HIVER - SUSSEX (1990)

Résumé: Dix cultivars de blé d'hiver ont été plantés à Sussex le 6 septembre 1989, et l'on a appliqué quatre niveaux de production pendant la saison de culture. On n'a pas enregistré d'écart important entre les niveaux de production pour ce qui est de la résistance à l'hiver, le poids de mille grains, le nombre de grains par épis, la population végétale et la date d'épiaison. Les divers traitements ont entraîné des écarts considérables dans le rendement, la verse, la hauteur des plants et la densité des épis. On a obtenu des résultats très différents entre les cultivars en ce qui concerne le rendement, le poids de mille grains, le nombre de grains par épis, la verse, la hauteur des plants, la résistance à l'hiver et la date d'épiaison.

INTRODUCTION: There has recently been higher levels of management and extra inputs applied to the production of grain. Each cultivar responds differently to management levels or chemical input, therefore, it is important to test cultivars under levels of management which will determine their strengths and weaknesses. These tests also provide invaluable information to producers on how to most economically manage individual cultivars to achieve maximum yields.

The four management level study included each cultivar replicated four times at a conventional level of management. The cultivars were then tested at a higher level of nitrogen. The higher level of nitrogen will usually expose lodging susceptibility and lack of disease resistance. In the third treatment, all cultivars have a higher level of nitrogen and a fungicide applied. This treatment will determine which cultivars will yield well without the aid of a growth regulator to prevent lodging. The fourth treatment includes additional nitrogen, fungicides and a growth regulator. This treatment identifies cultivars with high genetic yield potential that might have otherwise been discarded in a conventional testing program due to disease susceptibility or lodging.

This study is part of the ongoing testing procedure to identify superior yielding cultivars for production in the Maritimes. It is one of four test sites located throughout the Maritimes. Data from these trials form the basis for production recommendations in Publication 100A, Field Crop Guide for the Atlantic Provinces.

RESULTS & DISCUSSION: Yields of winter wheat ranged from 5.2 - 4.3, 5.3 - 4.1, 6.0 - 4.5 and 6.1 - 4.4 T/ha for treatments 1,2,3, and 4 respectively (Table 2). The cultivars yield rankings within treatments and the average rankings across all treatments did vary but the higher yielding cultivars, with only minor exceptions, tended to remain relatively constant across all treatments (Table 2). The highest yielding cultivars also tended to have the highest winter survival (Table 3). The only exception to this trend was Borden. Borden is a tall cultivar with a low harvest index and poor lodging resistance which tends to limit its' yield potential. Three of the four highest yielding cultivars; Ruby, 1959-W1-2 and Borden, across all treatments, had the highest winter survival(92%, 91% and 96% respectively) (Table 2 & 3). The average treatment yields ranged from 4.4, 4.7, 5.2, 5.4 T/ha for treatments 2, 1, 3 and 4 respectively. The low average yield of treatment 2 compared to treatment 1 is not uncommon. High levels of nitrogen without adequate disease protection can result in reduced grain yields.

Low T.K.W.'s for treatment 2 tend to support this conclusion as average T.K.W.'s range from 35.7, 39.1, 39.7 to 39.8 for treatments 2, 1, 3 and 4 respectively (Table 4). The yield and T.K.W.'s of both treatments 3 & 4 are very close indicating that the growth regulator had little effect. This is supported by lodging data which indicates lodging was not a major yield determining factor in this study (Table 5). In the absence of lodging, growth regulators have little effect on yield. If lodging were to occur, growth regulators maintain yields by reducing lodging, maintaining plant health, allowing more complete kernel filling and reducing harvest losses.

Kernels/head were not significant across treatment and therefore would have had little affect on treatment yield. There was a significant difference in Kernels/head between cultivars (Table 6). Kernels/head is highly influenced by the genetic makeup of the plant. However, low planting rate or poor winter survival, both of which can reduce final head populations, can result in increased kernels/head due to reduced competition within the plant stand. There appears to be some indication of this trend (Table 7). This demonstrates the flexibility of the components of yield: T.K.W., Kernels/head and head population to adjust to growing conditions in an attempt to maintain yield stability.

Plant populations immediately after seeding (fall of 1989) were relatively stable, ranging from a high of

327 to a low of 270 plants/m^2 across all cultivars. Plant populations across treatments were even more stable ranging from 290 for treatment 2 to 311 plants/m^2 for treatment 3 (Table 7).

Head populations at harvest had a wide range from 677 to 468 heads/m^2 (Table 8). In the case of winter wheat, the genetic makeup of the cultivar and winter survival have a large influence on final head populations. The higher yielding cultivars testedto have better winter survival and higher head populations compared to the lower yielding cultivars (Table 2,3,8). Treatment 2 had the lowest average head population (Table 8). This could have affected yields. It can only be speculated that the higher nitrogen level increased disease severity and stressed the plants, thereby reducing head populations.

Plant heights were relatively stable from 85 to 120 cm (Table 9). Heights, in the absence of a growth regulator, depend on the genetic makeup of the cultivar and growing conditions throughout the season. Treatment heights ranged from 92cm for treatment 4 to 102 cm for treatment 3. Treatment 4 was significantly shorter than the other 3 treatments (Table 9). This result is consistent with the effect of growth regulator application as it is applied to shorten and stiffen straw and reduce lodging.

Heading dates across cultivars ranged from June 17 to 27 whereas the heading date across treatments was June 23 (Table 10).

CONCLUSION: Yield and winter survival are the two most important factors in growing winter wheat in N.B. Four cultivars: Ruby, 1959-W1-2, Fundulea and Borden possess both of these criteria; therefore these are the cultivars/lines that growers should consider when producing winter wheat in N.B. The higher level of inputs did increase yields from treatments 2 to 4. However, before applying the higher level of inputs, farmers are advised to do a very careful cost-benefit analysis.

ACKNOWLEDGEMENT: The authors wish to thank George Walker for plot land used in this study. Appreciation is also expressed to summer students Charles Turner, Kimberley Keizer and Patricia Duplessis.

TABLE 1: SOIL ANALYSIS REPORT

Sample Depth (cm)	pH	Phosphate (kg/ha)	Potash (kg/ha)	Calcium (kg/ha)	Magnesium (kg/ha)
0-15	5.9	513+	450+	2124	183
15-30	5.8	513+	450+	1997	180
30-45	5.5	513+	430	1431	142

TABLE 2: YIELD (T/ha) OF WINTER WHEAT PRODUCTION MANAGEMENT STUDY

Cultivar	T1	T2	T3	T4	Av.
Ruby	5.2	4.8	5.6	5.6	5.3
1959-W1-2	5.1	5.3	5.6	6.1	5.5
Fundulea	5.0	4.8	6.0	6.1	5.5
Arina	4.8	4.0	4.9	4.4	4.5
Borden	40.6	5.0	5.3	6.0	5.2
Absolvent	4.5	3.8	5.2	5.1	4.6
Karat	4.4	4.0	5.4	5.5	4.8
Urban	4.4	4.3	4.6	4.5	4.5
Bernina	4.3	4.1	4.9	5.1	4.6
Perlo	4.3	4.3	4.5	5.4	4.6
Av.	4.7	4.4	5.2	5.4	
L.S.D. (.05) 0.9					
C.V. (%) 12.9					

* Cultivars ranked based on Treatment 1

TABLE 3: WINTER SURVIVAL (%)OF WINTER WHEAT PRODUCTION MANAGEMENT STUDY

Cultivar	T1	T2	T3	T4	Av.
Ruby	92	92	93	92	92
1959-W1-2	79	90	98	96	91
Fundulea	76	75	87	96	83
Arina	74	52	51	46	56
Borden	94	99	95	97	96
Absolvent	84	64	93	63	76
Karat	86	83	74	87	82
Urban	62	81	69	42	63
Bernina	54	52	80	71	64
Perlo	57	62	44	71	58
Av.	76	75	78	76	
L.S.D.(.05) 27					
C.V.(%) 25.0					

TABLE 4: T.K.W.(g) OF WINTER WHEAT PRODUCTION MANAGEMENT STUDY

Cultivar	T1	T2	T3	T4	Av.
Ruby	35.7	35.5	34.6	34.4	35.0
1959-W1-2	39.3	41.1	39.3	41.1	40.2
Fundulea	36.7	34.8	34.4	34.8	35.2
Arina	41.0	28.9	41.4	40.8	38.0
Borden	37.9	37.8	38.3	38.8	38.2
Absolvent	39.6	30.7	43.2	44.3	39.4
Karat	39.3	40.3	42.0	41.0	40.6
Urban	38.1	36.9	39.9	41.1	39.0
Bernina	43.3	41.5	43.1	41.1	42.3
Perlo	40.2	29.2	41.0	41.0	37.9
Av.	39.1	35.7	39.7	39.8	
L.S.D.(.05) 6.7					
C.V.(%) 12.4					

TABLE 5: HARVEST LODGING (0-9) OF WINTER WHEAT PRODUCTION MANAGEMENT STUDY

Cultivars	T1	T2	T3	T4	Av.
Ruby	2	1	3	1	2
1959-W1-2	2	2	2	2	2
Fundulea	0	0	0	1	0
Arina	1	1	1	0	1
Borden	6	5	7	4	6
Absolvent	0	1	3	0	1
Karat	1	0	1	0	0
Urban	0	0	0	0	0
Bernina	0	0	0	0	0
Perlo	1	1	3	1	1
Av.	1	1	2	1	
L.S.D.(.05) 1					
C.V.(%) 69.7					

TABLE 6: KERNELS/HEAD OF WINTER WHEAT PRODUCTION MANAGEMENT STUDY

Cultivar	T1	T2	T3	T4	Av.
Ruby	31	33	34	39	34
1959-W1-2	35	35	34	34	35
Fundulea	44	43	42	39	41
Arina	40	42	41	42	41
Borden	36	40	39	42	39
Absolvent	32	41	39	41	38
Karat	35	39	40	40	39
Urban	35	36	38	41	38
Bernina	39	43	42	42	41
Perlo	40	42	43	41	42
Av.	37	39	39	40	
L.S.D.(.05) 6					
C.V.(%) 10.8					

TABLE 7: PLANT POPULATION/m^2 OF WINTER WHEAT PRODUCTION MANAGEMENT STUDY

Cultivar	T1	T2	T3	T4	Av.
Ruby	352	276	384	297	327
1959-W1-2	294	326	316	353	322
Fundulea	308	256	258	348	293
Arina	266	257	362	291	294
Borden	293	306	303	306	302
Absolvent	349	297	279	252	294
Karat	319	338	302	313	318
Urban	284	260	273	261	270
Bernina	291	267	336	270	291
Perlo	297	316	297	309	305
Av.	305	290	311	300	
L.S.D.(.05) 94					
C.V.(%) 22.2					

TABLE 8: HEAD POPULATION/m^2 OF WINTER WHEAT PRODUCTION MANAGEMENT STUDY

Cultivar	T1	T2	T3	T4	Av.
Ruby	670	563	767	709	677
1959-W1-2	680	506	661	656	626
Fundulea	671	580	780	677	677
Arina	584	485	658	463	547
Borden	616	648	698	706	667
Absolvent	601	372	469	504	486
Karat	527	388	631	504	512
Urban	670	644	649	449	603
Bernina	517	561	639	595	578
Perlo	446	395	460	573	468
Av.	598	514	641	583	
L.S.D.(.05) 245					
C.V.(%) 30.0					

TABLE 9: PLANT HEIGHT (cm) OF WINTER WHEAT PRODUCTION MANAGEMENT STUDY

Cultivar	T1	T2	T3	T4	Av.
Ruby	102	99	106	89	99
1959-W1-2	89	84	88	81	85
Fundulea	96	95	98	89	94
Arina	102	99	102	90	98
Borden	123	123	125	111	120
Absolvent	99	99	103	89	97
Karat	114	108	111	101	108
Urban	93	92	96	83	91
Bernina	93	97	95	88	93
Perlo	100	98	101	96	99
Av.	101	99	102	92	
L.S.D.(.05) 5.6					
C.V.(%) 4.0					

TABLE 10: HEADING DATE (JUNE) OF WINTER WHEAT PRODUCTION MANAGEMENT STUDY

Cultivar	T1	T2	T3	T4	Av.
Ruby	21	21	21	21	21
1959-W1-2	16	17	17	17	17
Fundulea	24	23	23	23	23
Arina	26	25	26	25	25
Borden	22	22	22	23	22
Absolvent	22	21	22	23	22
Karat	23	23	23	23	23
Urban	27	28	28	27	27
Bernina	27	27	27	27	27
Perlo	23	24	24	24	24
Av.	23	23	23	23	
L.S.D.(.05) 2					
C.V.(%) 5.7					

LUPIN CULTIVAR EVALUATION - HARTLAND 1990

D.F. Walker and A.O.M. Smith

ABSTRACT: Five lupin cultivars were planted at Hartland on May 17. Yields ranged from 3.1 to 1.5 T/ha. Percent protein ranged from 28.7 to 34.6. During the harvest season it was noted that one cultivar, Skorospelz, had a very bitter taste indicating the presence of alkaloids. The remaining four cultivars were intermediate to sweet in taste.

ÉVALUATION DE CULTIVARS DE LUPINS - HARTLAND (1990)

Résumé: Cinq cultivars de lupin ont été plantés à Hartland le 17 mai. Les rendements variaient de 1,5 à 3,1 tonnes par hectare, et le taux de protéines variait de 28,7 à 34,6 p. 100. On a constaté à la récolte que le cultivar Skorospelz avait un goût très amer, l'indice de la présence d'alcaloïdes. La saveur des quatre autres cultivars variait de modérément sucrée à sucrée.

INTRODUCTION: Lupins (Lupinus L.) are a high yielding protein crop that have production potential in N.B. On farm and small plot work indicates that lupin yields can be superior to soybeans. It is unaffected by frost and therefore can be planted very early in the spring and continues to grow well beyond the earliest fall frost. Its' high yield potential could be due to its ability to maximize the growing season in the cool northern climate of N.B.

Lupins are a legume crop, therefore the plant produces its' own nitrogen. Field and plot observations indicate that there is little response to the other major fertility elements, phosphorus and potash. This suggests either that lupins have an excellent mechanism for retrieving these elements from low fertility soils or have low requirements for these two elements. Unlike soybeans, lupins do not contain a trypsin inhibitor, therefore seed does not have to be heat treated prior to feeding non-ruminant animals. Feeding observations indicate that lupins are equal to or superior to soybeans when fed to all classes of livestock.

Two weak points that could reduce the widespread production of lupins are susceptibility to diseases and late maturity. Rhizictonia and Ascochyta Blight[1] were noted in field plots and in farm fields strongly reducing lupin yields in 1990.

The predominant variety of lupins grown in eastern North America is sweet white. Its' normal harvest date is mid to late October and at this time of year there are few harvest days and in many cases fields are wet causing harvest difficulties. The late maturity will have to be overcome by either finding a variety that is earlier maturing or limiting production to only well drained fields.

Lupins are a new crop to N.B., therefore the purpose of this project was to evaluate the suitability of a number of lines for production potential in terms of yield, % protein, disease resistance and maturity.

MATERIALS & METHODS: On May 17, a Wintersteiger plot seeder was used to plant a lupin cultivar study at Hartland, N.B. Five cultivars were planted at 180 kg/ha in a R.C.B. design with four replications. The plots were 2m x 8.5m with a 12 cm row spacing. No chemical fertilizer was applied during the growing season due to very high soil analysis results. However, seed was inoculated just prior to seeding. All plots were harvested on November 2 with a small plot combine.

RESULTS AND DISCUSSION: Yields ranged from 3.1 for WTD 180 to 1.5 T/ha for Start (Table 1). Due to an oversight, the variety sweet white was not included in the trial. However, it was planted in a seeding rate study (6 rates)[2] adjacent to this study. The highest yields of sweet white across all seeding rates was 2.5 T/ha. Yields can not be statistically compared but it does appear that the two highest yielding cultivars, WTD 180 & Kiev Mutant show high yield potential.

Percent protein ranged from 28.7 to 34.6 indicating that there is a range in protein between varieties and that generally lupins can be considered as a high protein crop(Table 1).

Lupins are a large seeded crop with 100 seed weights ranging from 25.7 to 18.3g. Although all plots were seeded at 180 kg/ha, plant populations ranged from 38 to 61 plants/m^2 with no relationship between plant population and yield (Table 1).

Because lupins dry down over a long period of time, an exact maturity date is difficult to establish. Therefore, the varieties were only given an arbitrary visual maturity rating ranging from early, medium and late (Table 1).

The diseases, Rhizictonia and Ascochyta were certainly present at the plot area but because of the introductory nature of the trial, disease severity ratings were not taken. A general observation of whether a particular disease was present or absent is all that was noted.

Lodging ratings were taken September 12. Lodged plots or portions thereof appeared to be random and were more a function of disease level than lodging susceptibility of any particular cultivar (Table 1).

CONCLUSION: The results of this trial indicate that lupins have potential as a protein crop for N.B. The high yield of 3.1 T/ha approaches that of the more conventional crop oats. Further testing is required to confirm yield, protein, maturity date, lodging and disease susceptibility. This work will be continued in 1991.

REFERENCES: Personal communication Dr. Winston Johnston, Ag Canada Research Station Charlottetown, P.E.I.

Walker, D.F. and Smith, A.O.M. 1990. Lupin Seeding Rate Study. Adaptive Research Reports, N.B. Dept. of Agriculture. 12:

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TABLE 1: YIELD AND AGRONOMIC CHARACTERISTICS OF LUPIN CULTIVAR EVALUATION - HARTLAND 1990

Cultivar	Yield (T/ha)*	Protein (%)	Maturity **	Lodging	100 Seed Wt. (g)	Plant Pop./m^2
WTD 180	3.1	30.9	L	1	25.7	38
Kiev Mutant	2.8	28.7	L	0	25.2	43
Skorospel	2.7	31.5	M	0	27.8	26
Primorski	2.2	32.0	M	1	22.3	43
Start	1.6	34.6	E	3	18.3	61
L.S.D.(.05)	0.6	2.9	-	3	1.6	4
C.V.(%)	15.5	6.0	-	199.7	4.5	6.9

* 15% Moisture
** E - Early
M - Medium
L - Late

SPRING CANOLA CULTIVAR EVALUATION - HARTLAND 1990

D.F. Walker and A.O.M. Smith

ABSTRACT: Spring canola yields ranged from 2.5 to 1.9 T/ha for Delta and OAC Triton respectfully. Percent protein ranged from 20.6 to 23.4. All lines/cultivars graded Canada # 1. Soil tests were taken and analyzed for nematodes prior to planting and again after harvest. Prior to planting, 776 root-lesion and 309 stunt nematodes were present and after harvest, 14,000 root-lesion nematodes were present per kg of soil.

ÉVALUATION DE CULTIVARS DE CANOLA DE PRINTEMPS - HARTLAND (1990)

Résumé: Les rendements de canola du printemps s'établissaient à 1,9 et 2,5 tonnes par hectare respectivement pour les cultivars OAC Triton et Delta. Le taux de protéines variait de 20,6 à 23,4 p. 100. Les variétés/cultivars étaient classés Canada n° 1. Les analyses du sol ont été faites avant la plantation et après la récolte pour détecter la présence de nématodes. Avant la plantation, on a détecté 776 nématodes des lésions et 309 rabougrissements nématiques; après la récolte, on a relevé la présence de 14 000 nématodes des lésions par kilogramme de sol.

INTRODUCTION: Canola (rapeseed) is a non-legume, high protein crop. It should be a natural for N.B. as it has a relatively short season, is not affected by frost and grows well in a cool moist climate. It will grow on low pH soils, tolerate conditions of medium to low fertility and wet soils. Canola is also relatively high valued when compared to the traditional grain crops: wheat, barley, and oats. There has been a reluctance to grow canola because producers have to modify production practices. Seeding rates are lower than conventional grain (5-7 kg/ha) requiring a small seed box. It must be either swathed or desiccated and handling equipment ie. bulk bodies, have to be much tighter to avoid seed loss. A higher level of storage management is required to avoid heating.

There has been a renewed interest in canola. Field observations have indicated that other brassicas (broccoli) when planted in rotation with potatoes results in a significant increase in yield and quality. It has been suggested that the yield and quality increase are a result of reduced disease levels (early die down complex). The speculation is that the decomposing brassica (broccoli) residue produces a natural soil fumigant (iso thio cyanic gas) which reduces nematode populations which in turn reduces stress on the potato plant, thereby reducing root infection diseases.

The objective of this study was to evaluate the production feasibility of canola and to determine if it would reduce nematode populations.

MATERIALS & METHODS: On May 4, eleven spring canola cultivars were seeded at 5.0 kg/ha at Hartland, N.B. Plot design was R.C.B. with 4 replications. Each 2m *

8.5m plot was seeded using a Wintersteiger plot seeder with a row spacing of 12 cm. Table 1 is a soil analysis of a soil sample collected from the plot area at three different soil depths prior to planting. An application of 250 kg/ha of 17-17-17 was broadcast and incorporated prior to seeding. Roundup was used to desiccate the canola on August 24. All plots were harvested on August 27 with a Hege plot combine.

RESULTS & DISCUSSION: Yields of the eleven cultivars ranged from 2.4 to 1.9 T/ha with no significant difference (Table 2). These yields are much higher than anticipated but are not surprising considering the extremely vigorous growth exhibited during the growing season.

The average percent protein was 21.7. Percent protein was determined on a composite sample of all four replications, therefore, data was not analyzed statistically. Lodging did not occur on any cultivar (Table 2). A composite sample of all four replications, of each cultivar/line, was sent to the Canadian Grain Commission in Montreal and each cultivar/line graded Canada # 1 (Table 2).

Soil samples were taken and analyzed for nematode population both prior to and after harvest. Populations prior to planting were very low, 776 Root Lesion and 309 Stunt Nematodes per kg of soil. After harvest, Root Lesion nematode populations had exploded to 14,000 per kg of soil. All other nematodes including, Pin, Spiral, Stunt, Root-Knot and Clover Cyst remained at very low levels (Table 3). These results would indicate that during the growing season canola is an excellent host for nematodes. Samples will be taken in the spring of 1991 to determine if nematode populations collapse as a result of crop decomposition.

CONCLUSION: Yields of canola were very high indicating production potential. During the growing season canola appears to be an excellent host for Root Lesion nematodes. It remains to be determined if the decomposition of canola plant material will reduce nematode populations.

ACKNOWLEDGEMENTS: The authors wish to thank Harold Culberson for plot land and appreciation is also expressed to summer students Charles Turner, Kimberly Keizer and Patricia Duplessis.

TABLE 1: SOIL ANALYSIS REPORT - HARTLAND 1990

Sample Depth (cm)	pH	Phosphate (kg/ha)	Potash (kg/ha)	Calcium (kg/ha)	Magnesium (kg/ha)
0 - 15	6.3	513+	450+	2360	255
15 - 30	6.2	513+	450+	2191	260
30 - 45	6.1	513+	450+	1509	239

TABLE 2: YIELD AND PROTEIN CONTENT OF SPRING CANOLA CULTIVARS - HARTLAND 1990

Cultivars	Yield T/ha (12 % Moisture)	Protein (%)
Delta	2.5	20.6
W 1471	2.4	20.9
Topas	2.4	20.8
OAC Triumph	2.3	23.8
Stallion	2.3	23.4
Westar	2.3	20.8
Legend	2.2	20.8
Vanguard	2.2	21.8
Celebra	2.0	21.7
Comet	1.9	21.0
OAC Triton	1.9	22.8
L.S.D. (.05)	0.6	-
C.V. (%)	18.0	-

* All cultivars/lines graded Canada # 1.

TABLE 3: ROOT LESION & STUNT NEMATODE POPULATIONS (per kg of soil) - Hartland 1990

	Root Lesion Nematode	Stunt Nematode
Before Planting	776	309
After Harvest	14,000	-

BORDEN WINTER WHEAT SEEDING RATE BY DATE STUDY SUSSEX 1990

D.F. Walker and A.O.M. Smith

ABSTRACT: Borden winter wheat was seeded at six rates, from 100 - 600 vk/m^2 on September 6, 13, and 20, 1990 at Sussex, N.B. Yields increased as seeding rate increased with the greatest response on the latest date. A similar effect was noted with heads/m^2. The earliest date and the highest rates had the highest overall head populations. Winter survival declined as seeding date was delayed and as seeding rate decreased. Although not significant, there appeared to be improved winter survival at the higher seeding rate. Plant height declined with delayed seeding date, but increased on the first two dates as seeding rate increased. T.K.W. increased as planting date was delayed and decreased with increased seeding rate on September 6 and 13. The reverse occurred with the final planting date. Kernel number per head declined as seeding rate was increased across all three planting dates.

ÉTUDE DE TAUX D'ENSEMENCEMENT À DIFFÉRENTES DATES DU BLÉ D'HIVER BORDEN - SUSSEX (1990)

Résumé: Le blé d'hiver Borden a été soumis à six taux d'ensemencement variant de 100 à 600 vk/m^2 les 6, 13 et 20 septembre 1990 à Sussex (N.-B.). Les rendements ont augmenté proportionnellement au taux d'ensemencement, et le meilleur rendement obtenu correspondait à la dernière date d'ensemencement. Les mêmes résultats ont été observés en ce qui concerne le nombre d'épis par mètre carré. L'ensemencement fait à la première date et les rendements les plus élevés correspondaient aux plus grandes densités d'épis en général. La résistance à l'hiver diminuait lorsque les dates d'ensemencement étaient plus tardives et que le taux d'ensemencement était moins important. Même si l'écart n'était pas considérable, on a constaté que la résistance à l'hiver était meilleure lorsque le taux d'ensemencement était plus élevé. La hauteur des plants diminuait à mesure que la date d'ensemencement progressait, mais elle était plus grande pour les deux premières dates lorsque les taux d'ensemencement augmentaient. Le poids de mille grains a augmenté proportionnellement à la progression de la date de plantation, et il était moins élevé pour les taux d'ensemencement accrus des 6 et 13 septembre. On a observé des résultats inverses pour la dernière date de plantation. L'augmentation du taux d'ensemencement aux trois dates de plantation a entraîné une diminution du nombre de grains par épi.

INTRODUCTION: Winter wheat is an excellent crop for farmers to grow. Two advantages are high yield and fall planting that provides a winter cover crop which reduces soil erosion. Fall planting and an early August harvest tends to spread the work load. New Brunswick is on the northern fringe where winter wheat will survive. It is with only the most winter hardy varieties and optimum seeding date and ideal management practises that will ensure some degree of winter survival. Two factors that have a large influence on winter survival that the farmer can control are seeding date and seeding rate.

The objective of this study was to determine the optimum seeding rate and date for Borden winter wheat to achieve maximum yield and winter survival.

MATERIALS & METHODS: Borden winter wheat was planted at Sussex, N.B. at seeding rates of 100 - 600 vk/m^2 on September 6, 13 and 20, 1989. A Wintersteiger plot seeder was used to plant the different seeding rates in a R.C.B. design with four replications. Table 1 is a soil analysis report from a soil sample that was collected at three different sampling depths prior to planting. Before planting, 200 kg/ha of 17-17-17 was broadcast and incorporated. An additional 200 kg/ha of

34-0-0 was manually broadcast at G.S. 21 (April 18,1990), and again at G.S. 25-31 (June 11, 1990). A small plot sprayer was used to apply a tank mixture of Buctril M (1l/ha), Bayleton (125g ai/ha), Dithane M45 (1kg ai/ha) and Cycocel (1.5l/ha) at G.S. 25-31 (May 15,1990). All plots were harvested on August 10, 1990 with a small plot combine.

RESULTS & DISCUSSION: Yields ranged from 3.3 - 5.2, 1.7 - 5.3 and 1.4 - 4.5 T/ha as seeding rates were increased from 100 - 600 vk/m^2 and dates delayed from September 6, 13 and 20 respectively (Table 2, Fig. 1). Yield response to increased seeding rate increased as planting is delayed. With the September 6 seeding date, there is no significance yield response beyond 200 vk/m^2. If seeding is delayed to September 13, 300 vk/m^2 is required to produce the same yield and with September 20, 500 vk/m^2 are required (Table 2, Fig. 1).

The components of yield: heads/m^2 and kernels/head are relatively elastic and can compensate for oversights in cereal management. This same effect is true with kernel size, but to a much smaller degree. The ability of the components of yield to compensate over a wide range of plant populations caused by winter survival, poor germination and/or seeding depth results in a high level of yield stability. The combination of a high level of tillering, excellent winter survival, high kernels/head and to some degree a increased T.K.W. has led to no significant yield differences on a wide range of seeding rates from 200 - 600 vk/m^2 on the September 6 planting date (Table 2,3,4,5,6). As the seeding date was delayed, the constraints of climate reduced the ability of the plant to tiller and to compensate for low seeding rates resulting in decreased yields. The other factors, kernels/head and T.K.W. which are determined in the spring, were unaffected by delayed planting (Table 4,5, Fig. 3,4). Winter survival was also greatly reduced by delaying seeding date and reducing seeding rate (Table 6, Fig. 5). This is the result of two factors: the very young plant does not appear to have winter hardiness and possibly the most critical factor is the reduced crop canopy does not have the insulating capacity (mulch effect or the ability to trap snow) to aid in winter survival.

With the two earliest planting dates (September 6 and 13), the higher seeding rates resulted in significantly higher plant heights caused by within crop competition (Table 7, Fig. 6). Seeding rate had no effect on plant height of the later date of September 20. It appears that the higher plant heights of the earlier planting date (September 6) resulted in increased lodging (Table 8, Fig. 7).

All plots were rated for mildew and septoria on July 12. There appears to be no relationship of disease severity to either planting rate or date (Table 9,10, Fig. 8,9). The levels of disease for both mildew and septoria were low compared to other seasons and were not a factor in determining yield.

CONCLUSION: From this study, there is a strong indication that early planting (September 6) and a seeding rate of 300 vk/m^2 (120 lbs./ac) will ensure optimum winter survival. If seeding date is delayed, increased seeding rate will improve winter survival and could result in a higher yield.

ACKNOWLEDGEMENTS: The authors wish to thank George Walker for plot land and to summer students; Charles Turner, Kimberley Keizer and Patricia Duplessis

TABLE 1: SOIL ANALYSIS REPORT
SUSSEX - 1990

Sample Depth (cm)	pH	Phosphate (kg/ha)	Potash (kg/ha)	Calcium (kg/ha)	Magnesium (kg/ha)
0-15	5.9	513+	450+	2124	183
15-30	5.8	513+	450+	1997	180
30-45	5.5	513+	430	1431	142

TABLE 2: YIELD (T/ha) OF BORDEN WINTER WHEAT
SEEDING RATE BY DATE STUDY

Seeding Rate (vk/m^2)	Sept. 6	Sept. 13	Sept. 20
100	3.3 d	1.7 e	1.4 e
200	4.6 abc	3.2 d	1.9 e
300	5.3 a	4.7 abc	2.9 d
400	5.3 a	4.8 abc	3.1 d
500	5.2 ab	5.1 abc	4.4 c
600	5.2 ab	5.3 a	4.5 bc
L.S.D.(.05) 0.7			
C.V.(%) 12.7			

TABLE 3: HEAD POPULATION/m^2 OF BORDEN WINTER WHEAT
SEEDING RATE BY DATE STUDY

Seeding Rate (vk/m^2)	Sept. 6	Sept.13	Sept. 20
100	461	244	234
200	529	403	249
300	668	375	416
400	554	522	381
500	690	601	501
600	613	766	695
L.S.D.(.05) 265			
C.V.(%) 37.4			

TABLE 4: KERNELS/HEAD OF BORDEN WINTER WHEAT
SEEDING RATE BY DATE STUDY

Seeding Rate (vk/m^2)	Sept. 6	Sept.13	Sept. 20
100	52	51	51
200	47	50	48
300	42	47	49
400	41	46	47
500	42	46	52
600	37	42	45
L.S.D.(.05) 5			
C.V.(%) 7.9			

TABLE 5: T.K.W.(g) OF BORDEN WINTER WHEAT
SEEDING RATE BY DATE STUDY

Seeding Rate (vk/m^2)	Sept. 6	Sept.13	Sept. 20
100	38.8	38.9	38.8
200	37.3	38.0	40.0
300	34.8	37.2	41.1
400	35.5	37.0	40.2
500	34.1	35.4	42.4
600	35.0	34.8	41.1
L.S.D.(.05) 2.5			
C.V.(%) 4.6			

TABLE 6: WINTER SURVIVAL (%) OF BORDEN WINTER WHEAT
SEEDING RATE BY DATE STUDY

Seeding Rate (vk/m^2)	Sept. 6	Sept.13	Sept. 20
100	74	44	21
200	76	46	18
300	83	59	21
400	85	49	23
500	81	56	21
600	88	55	20
L.S.D.(.05) 16			
C.V.(%) 21.3			

TABLE 7: PLANT HEIGHT (cm) OF BORDEN WINTER WHEAT
SEEDING RATE BY DATE STUDY

Seeding Rate (vk/m^2)	Sept. 6	Sept.13	Sept. 20
100	101	94	94
200	106	96	93
300	110	103	95
400	110	104	96
500	111	105	97
600	112	108	94
L.S.D.(.05) 6.3			
C.V.(%) 4.3			

TABLE 8: LATE LODGING (0-9) OF BORDEN WINTER WHEAT
SEEDING RATE BY DATE STUDY

Seeding Rate (vk/m^2)	Sept. 6	Sept.13	Sept. 20
100	2	3	5
200	2	2	3
300	5	2	3
400	4	1	3
500	6	1	1
600	5	2	2
L.S.D.(.05) 2			
C.V.(%) 42.5			

TABLE 9: MILDEW RATING (0-9) OF BORDEN WINTER WHEAT
SEEDING RATE BY DATE STUDY (JULY 12)

Seeding Rate (vk/m^2)	Sept. 6	Sept.13	Sept. 20
100	2	4	3
200	2	3	3
300	2	1	3
400	2	2	3
500	2	2	2
600	3	2	2
L.S.D.(.05) 1			
C.V.(%) 45.2			

TABLE 10: SEPTORIA RATING (0-9) OF BORDEN WINTER WHEAT SEEDING RATE BY DATE STUDY (JULY 12)

Seeding Rate (vk/m^2)	Sept. 6	Sept.13	Sept. 20
100	3	2	3
200	4	3	4
300	4	4	3
400	5	4	4
500	5	5	3
600	4	4	4
L.S.D.(.05) 1			
C.V.(%) 23.3			

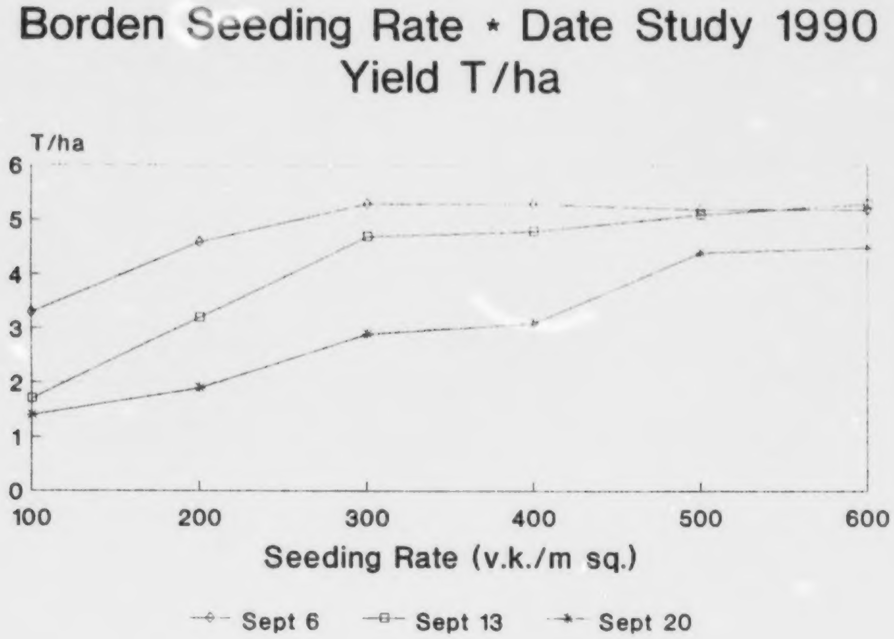

Borden Seeding Rate * Date Study 1990
Yield T/ha
T/ha
6
5
4
3
2
1
0
100
200
300
400
500
600
Seeding Rate (v.k./m sq.)
Sept 6
Sept 13
Sept 20

Fig. 1

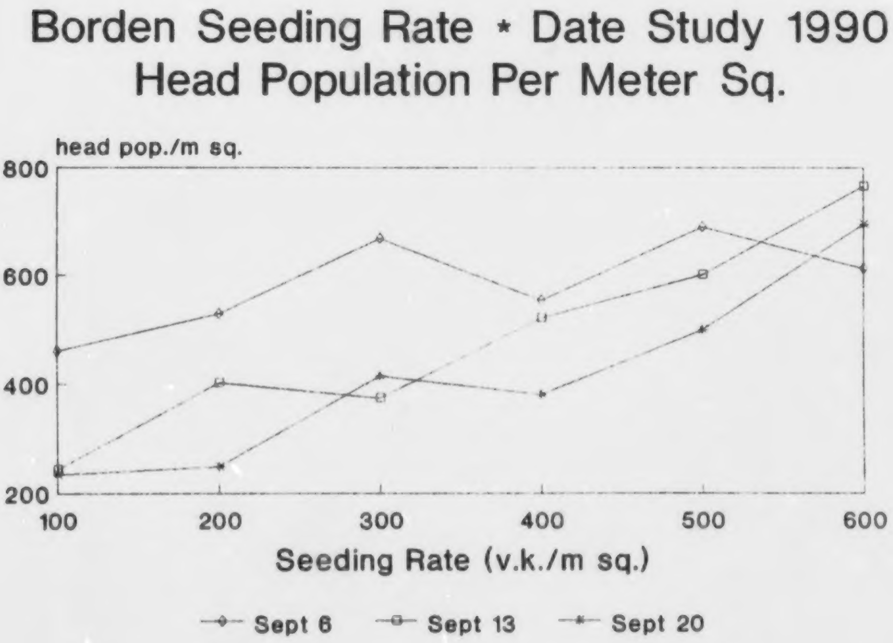

Borden Seeding Rate * Date Study 1990
Head Population Per Meter Sq.
head pop./m sq.
800
600
400
200
100
200
300
400
500
600
Seeding Rate (v.k./m sq.)
Sept 6
Sept 13
Sept 20

Fig. 2

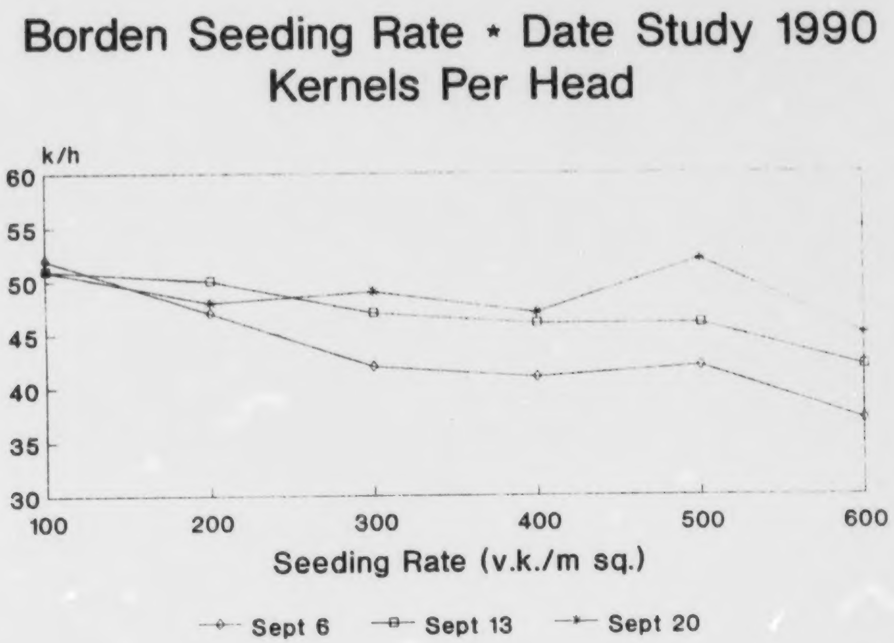

Borden Seeding Rate * Date Study 1990
Kernels Per Head

Fig. 3

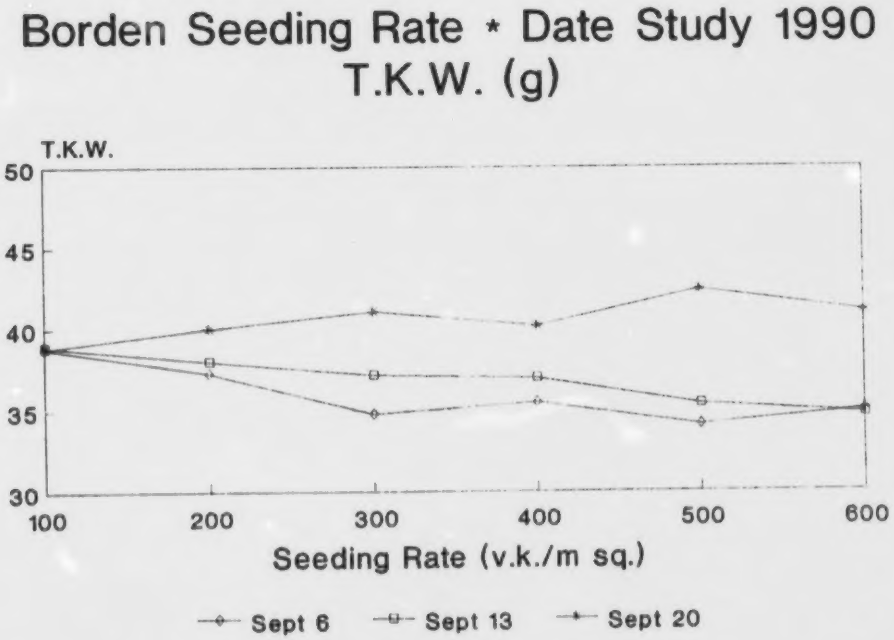
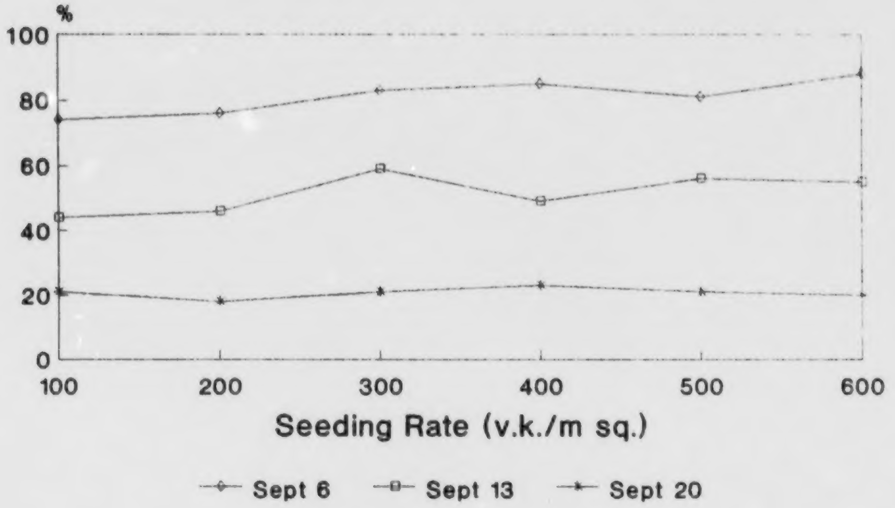
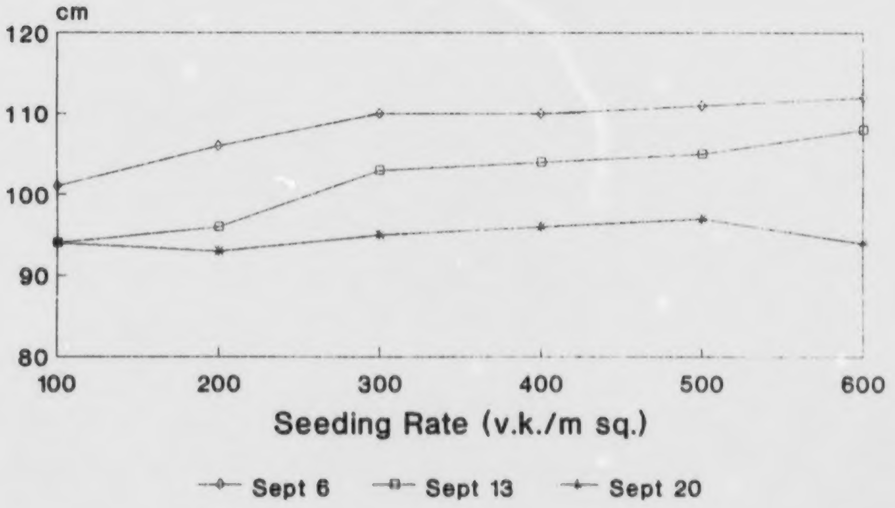

Borden Seeding Rate * Date Study 1990
T.K.W. (g)

Fig. 4



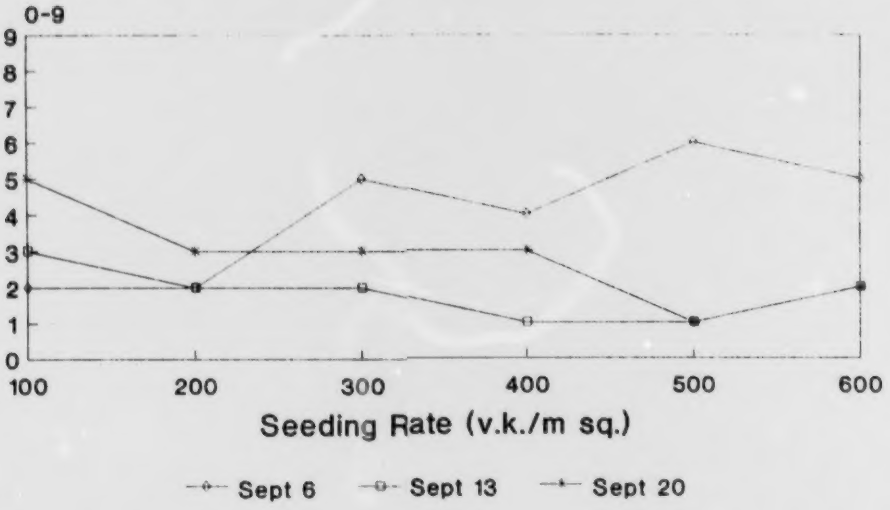
Borden Seeding Rate * Date Study 1990
Winter Survival %

Fig. 5



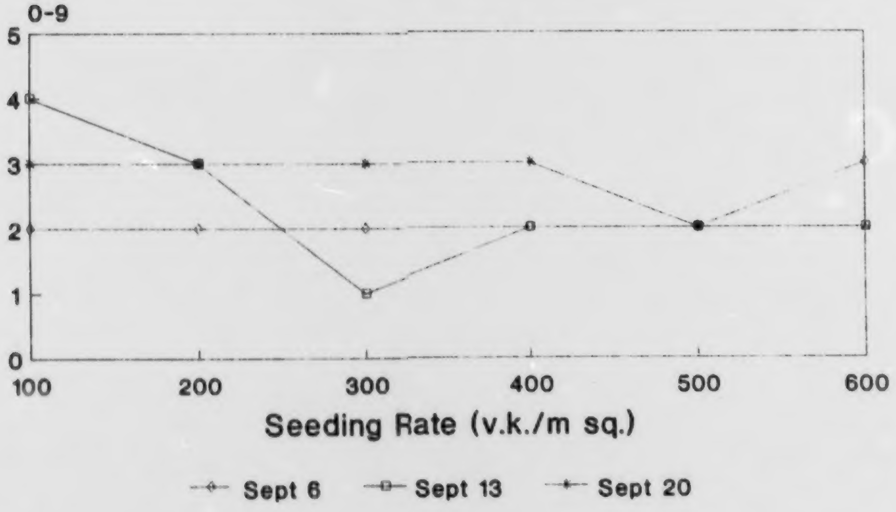
Borden Seeding Rate * Date Study 1990
Plant Height (cm)

Fig. 6



Borden Seeding Rate * Date Study 1990
Harvest Lodging (0-9)

Fig. 7



Borden Seeding Rate * Date Study 1990
Mildew

Fig. 8

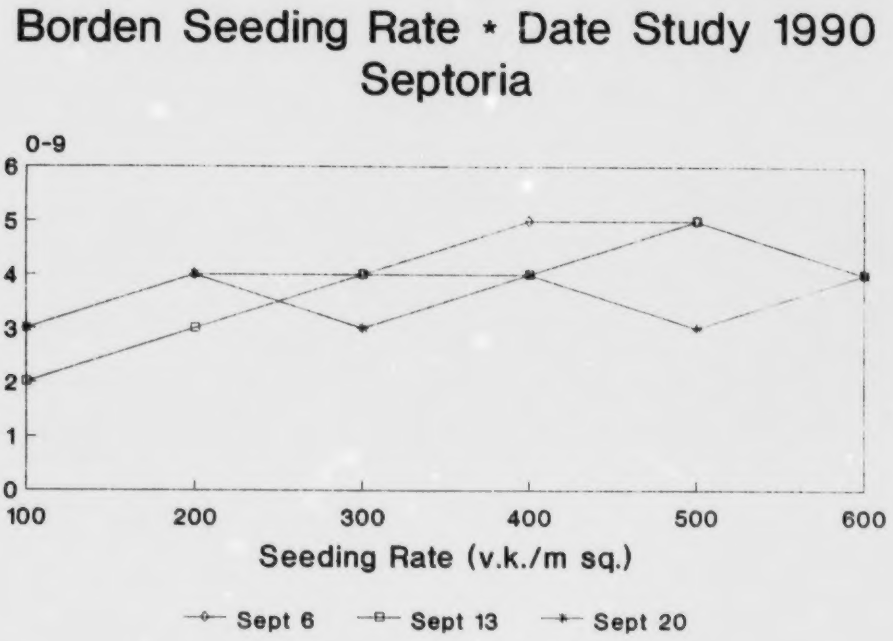

Borden Seeding Rate * Date Study 1990
Septoria
0-9
6
5
4
3
2
1
0
100
200
300
400
500
600
Seeding Rate (v.k./m sq.)
Sept 6
Sept 13
Sept 20

Fig. 9

LUPIN SEEDING RATE STUDY - SUSSEX & HARTLAND 1990

D.F. Walker and A.O.M. Smith

ABSTRACT: Yields ranged from 0.6 to 2.1 T/ha at the Sussex location and from 1.0 to 2.5 T/ha at the Hartland location. At the Sussex location yields appeared to be strongly related to seeding rate. The same relationship occurred at Hartland but only at the 50 and 100 kg/ha seeding rates. Seed weight was significantly higher at the high seeding rate at the Sussex location, and there was no significant difference at Hartland. Plant population had a wide range at both locations and was strongly related to seeding rate.

ÉTUDE DE TAUX D'ENSEMENCEMENT DES LUPINS - SUSSEX ET HARTLAND (1990)

Résumé: Les rendements variaient de 0,6 à 2,1 tonnes par hectare à Sussex et de 1 à 2,5 tonnes par hectare à Hartland. Les rendements enregistrés à Sussex semblaient dépendre beaucoup du taux d'ensemencement. Ce même phénomène a été observé à Hartland, mais seulement pour les taux d'ensemencement de 50 kg par hectare et de 100 kg par hectare. Le poids des graines était beaucoup plus considérable aux taux d'ensemencement supérieurs de Sussex, mais il n'y avait pas d'écart important à Hartland. La population végétale était très variable aux deux endroits, et elle correspondait beaucoup au taux d'ensemencement.

INTRODUCTION: Lupins (Lupinus L.) are a high yielding protein crop that have production potential in N.B. On farm and small plot work indicates that lupin yields can be superior to soybeans. Lupins are unaffected by frost and therefore can be planted very early in the spring and will continue to grow well beyond the earliest fall frost. Its' high yield potential could be due to its ability to maximize the growing season in the cool northern climate of N.B.

Lupins are a legume crop, therefore the plant produces its' own nitrogen. Field and plot observations indicate that there is little response to the other major elements, phosphorus and potash. This suggests either that lupins have an excellent mechanism for retrieving these elements from low fertility soils or have low requirements for these two elements. Unlike soybeans, lupins do not contain a trypsin inhibitor, therefore seed does not have to be heat treated prior to feeding non-ruminant animals. Feeding observations indicate that lupins are equal to or superior to soybeans when fed to all classes of livestock.

Two weak points that could reduce the widespread production of lupins are susceptibility to diseases and late maturity. Rhizictonia and Ascochyta Blight were noted in field plots and in farm fields strongly reducing lupin yields in 1990.

The predominant variety of lupins grown in eastern North America is sweet white. Its' normal harvest date is mid to late October and at this time of year there are few harvest days and in many cases fields are wet causing harvest difficulties. The late maturity will have to be overcome by either finding a variety that is earlier maturing or limiting production to only well drained fields.

The objective of this study was to determine optimum seeding rate to maximize yield and other agronomic characteristics.

MATERIALS & METHODS: A lupin seeding rate study was planted in Sussex on April 30 and another in Hartland on May 4. Both studies were planted with a Wintersteiger plot seeder with 12 cm row spacings. Plot design was R.C.B. with 4 replications and plot size was 2 X 8.5m. Seeding rate was from 50 - 300 kg/ha in increments of 50. A Hege 125B plot combine was used to harvest the plots in Sussex on October 17 and in Hartland on November 6.

RESULTS & DISCUSSION: Two seeding rate studies, one at Sussex and the other at Hartland, had seeding rates ranging from 50 to 300 kg/ha of seed in increments of 50. At the Sussex location yields ranged from 0.6 to 2.1 T/ha and were strongly related to seeding rate (Table 1). The same relationship occurred at Hartland but only at the 50 and 100 kg/ha seeding rate (Table 2).

The very low yield at the 50 and 100 kg/ha seeding rate at Sussex can be partially explained due to severe weed competition through the mid to late growing season. Lack of crop competition and herbicide application resulted in unsatisfactory weed control. The higher seeding rates, 200, 250 and 300 kg/ha, had satisfactory yields of 1.9, 2.0 and 2.1 T/ha respectively (Table 1). Weeds were less prominent in the higher seeding rates and had little or no influence on crop yield.

At the Hartland location, the only significant yield difference occurred between the 50 and 100 kg/ha seeding rate (Table 2). Yields from the 100 to 300 kg/ha seeding rate were not significantly different, reaching a plateau of 2.2 to 2.5 T/ha respectively. Unlike the Sussex location, weed competition had a minimal effect on plot yields (Table 2).

It appears that the lupin crop has the ability to compensate for low seeding rates by either increasing pods per plant or seeds per pod. In the absence of within crop competition, secondary and tertiary branching can occur with pod development at each stage of growth. Later pod development could lead to delayed maturity and therefore delayed harvest. This was not observed at either location due to delayed harvest caused by frequent rain during the fall of 1990.

At both locations, plant populations increased with each increase in seeding rate ranging from 13 to 73 at

Sussex and 17 to 51 plants/m^2 at Hartland (Tables 1 & 2). At the Sussex location yield, seeding rate and plant population were strongly related. At the Hartland location, with the exception of the 50 and 100 kg/ha seeding rate, yields do not increase correspondingly to increasing seeding rates and plant populations.

At the Sussex location seed weight increased from the low to the high seeding rate (33.9 to 39.2g),(Table 1). This effect could be due to severe weed competition at the low seeding rates. There was no significant difference in 100 seed weights at the Hartland location (Table 2).

CONCLUSION: It is difficult to conclude from these two studies what the optimum seeding rate for lupins should be in N.B. This study will be repeated in 1991 with greater emphasis placed on weed control and crop maturity. Data will also be collected on pod number per plant, seeds per pod, secondary and tertiary branching.

ACKNOWLEDGEMENTS: The authors wish to thank George Walker of Sussex and Harold Culberson of Hartland for plot land used in these studies. Appreciation is also expressed to summer staff Charles Turner, Kimberley Keizer and Patricia Duplessis.

TABLE 1: YIELD AND AGRONOMIC CHARACTERISTICS OF LUPIN SEEDING RATE STUDY - SUSSEX 1990

Seeding Rate (kg/ha)	Yield (T/ha) (15 % Moisture)	100 Seed Wt. (g)	Plant Population (m^2)
50	0.6	33.9	13
100	1.0	34.4	18
150	1.4	37.3	35
200	1.9	38.7	42
250	2.0	38.2	59
300	2.1	39.2	73
L.S.D. (0.5)	0.4	2.6	11
C.V. (%)	16.3	4.6	18.5

TABLE 2: YIELD AND AGRONOMIC CHARACTERISTICS OF LUPIN SEEDING RATE STUDY - HARTLAND 1990

Seeding Rate (kg/ha)	Yield (T/ha) (15 % Moisture)	100 Seed Wt. (g)	Plant Population (m^2)
50	1.0	25.8	17
100	2.2	24.8	21
150	2.3	27.5	24
200	2.4	26.6	34
250	2.3	26.6	44
300	2.5	27.3	51
L.S.D. (0.5)	0.5	4.4	8
C.V. (%)	14.6	11.2	16.7

BARLEY AND SPRING WHEAT UNDERSEEDING STUDY HARTLAND 1990

D.F. Walker and O.A.M. Smith

ABSTRACT: Duke barley and Belvedere spring wheat were underseeded with five different forage crops and a non-underseeded check at Hartland, N.B. Four parameters: yield, thousand kernel weight (TKW), Kernels per head (K/H), plant height and lodging were collected on Duke barley. There were no significant differences with any of the treatments. Three parameters: yield, TKW and lodging were collected on Belvedere spring wheat with only Aubade ryegrass significantly decreasing grain yield. Soil was analyzed for nematode populations with no significant difference in nematode population; however, they were 4 to 8 times more numerous at harvest than in the spring.

ÉTUDE DE LA CULTURE EN SOUS-SEMIS DE L'ORGE ET DU BLÉ DE PRINTEMPS - HARTLAND (1990)

Résumé: De l'orge Duke et du blé de printemps Belvedère ont été contre-ensemencés à Hartland (N.-B.) avec cinq différentes cultures fourragères, et une parcelle témoin n'a pas été contre-ensemencée. On a vérifié le rendement, le poids de mille grains, le nombre de grains par épi, la hauteur du plant et le degré de verse pour l'orge Duke, sans relever de grands écarts dans tous les traitements. L'analyse du rendement, du poids de mille grains et de la verse a été faite pour le blé de printemps Belvedère, et seul l'ivraie Aubade a réduit sensiblement le rendement des grains. On a analysé le sol pour détecter des variantes dans les populations de nématodes, sans toutefois relever d'écarts importants; par contre, les nématodes étaient de quatre à huit fois plus nombreux à la récolte qu'au printemps.

INTRODUCTION: The purpose of underseeding was to establish two crops at one time, therefore eliminating the cost of establishing the second crop. This practice frequently resulted in unsatisfactory yield or establishment of one of the crops, depending on weather condition in the establishment year.

In the past underseeding a cereal plot with forages was not recommended due to a number of factors. Weed control was usually more difficult and frequently unsatisfactory. Grain harvest was often more difficult particularly when harvest was delayed due to poor weather. Forage establishment is suppressed when conditions are ideal for cereal growth resulting in an unsatisfactory forage stand. These difficulties still remain, however, the low grain prices since the mid 1980's has redirected the focus of grain production in the potato belt from one of high grain yield to maximizing rotational benefits.

Grain is an excellent rotation crop in that it breaks disease cycles, establishes quickly reducing erosion, improves soil structure, and provides a cash crop. From a soil structure point of view, grain is highly beneficial up until approximately 15 days prior to harvest. At this point the root system dies and no further soil building activity takes place. A grain crop underseeded to forages will continue the soil building process until plowed. Even though underseeding requires greater attention to weed control and can result in lower grain yields and/or poor forage establishment, some producers are wiling to make these sacrifices for a higher pay off in a rotation crop.

Each individual forage crop has its' advantages and disadvantages. Legumes fix nitrogen and improve soil structure, thereby benefiting the following crop. However, it has been suggested that red clover is a host for nematodes and some diseases. Forage grasses do not fix nitrogen, therefore requiring fertilizer applications. However, they are superior to legumes in building soil structure and are non-hosts for nematodes and many potato diseases.

The purpose of this experiment was to evaluate the compatibility of grain underseeded to forages and the effects on grain yield, harvesting, weed control and forage establishment.

MATERIALS & METHODS: Duke barley was planted on May 10 and Belvedere spring wheat was planted on May 4 with a Wintersteiger plot seeder. Both cereals were underseeded with five different forage crops and a non-underseeded check in a R.C.B. design with four replications. The two cereals were planted at 350 vk/m^2 and each underseeded forage crop was planted at the recommended rates (Tables 2 & 3). Legumes were inoculated at planting with their proper rhizobia. A soil sample was collected from the plot area atthree different depths prior to planting (Table 1). Prior to planting, 250 kg/ha of 17-17-17 was broadcast and incorporated. An additional application of 150 kg/ha of 34-0-0 was broadcast at G.S. 31-32. Tropotox Plus (4 l/ha), Tilt (125g ai/ha) and Cycocel (200g ai/ha) were applied at G.S. 12-15 with a small plot sprayer. Four representative soil samples were taken from the Duke and Belvedere plot area prior to planting and after harvest. A soil sample was collected from all Duke plots for nematode analysis after harvest. All barley plots were harvested on August 17 and all spring wheat plots were harvested on August 27 with a small plot combine (Hege 125 B). Lodging data was not collected as there was no perceptible difference in lodging at harvest (Table 2).

RESULTS & DISCUSSION: Underseeding with the forage crops had no significant effect on yield, TKW, K/H or plant height (Table 2). All forages established satisfactorily with the exception of Lemtal ryegrass. Lemtal had a low plant population during the growing season, however, once the grain was harvested the existing plants tillered to give an adequate ground cover. Weed control in all plots was satisfactory with no major escapes. Soil samples were taken prior to planting and tested for nematodes: root-lesion, pin, spiral, stunt, root-knot and clover cyst. Only two species at very low levels were found, root-lesion at 776 and stunt at 309 nematodes per kg of soil. At harvest, nematode populations were four to eight times higher for the root-lesion species. Three other species, stunt, root-knot and spiral were found but at much lower levels. There was no significant difference in nematode population as a result of any underseeded treatment (Table 4). The lack of significance could be due to the high variability between samples.

The Aubade (Westerwolds) ryegrass produced a seed head and was as tall as the barley at harvest. It did not cause harvesting difficulties with the small plot combine, however, it could cause problems with large commercial combines due to the volume of green material moving through the machine. All other forages were short and insignificant at harvest.

The underseeded Aubade ryegrass was the only treatment that significantly reduced the yield of Belvedere spring wheat. With this treatment, the yield was 3.1 T/ha, and all other treatments ranged from 4.1 to 3.9 T/ha (Table 3). During the growing season, Aubade grew very aggressively and produced a seed head that was only slightly lower in height than the spring wheat. It can only be concluded that the severe competition from the Aubade ryegrass reduced the grain yield. None of the underseeded treatments affected the TKW. Lodging did not occur in any of the plots. Aubade ryegrass did not cause harvesting difficulty in the small plot combine but would cause problems with a large commercial combine due to the volume of green material going through the combine. All other forages were short and insignificant at harvest.

CONCLUSION: Of both grain species tested, only wheat underseeded with Aubade ryegrass showed any significant yield decreases. No harvesting difficulty was observed due to crop competition from the underseeded forages. Aubade ryegrass, because of its' volume of green material and tall stature could pose serious problems for large commercial combines and is therefore not recommended for underseeding. Nematode results were inconclusive, however, there appears to be some forage species that encourage nematode production. This project will be repeated in 1991 to further evaluate yield and nematode populations as affected by the underseeded forages.

ACKNOWLEDGEMENTS: The authors wish to thank Harold Culberson for plot land and also thank summer students

Charles Turner, Kimberley Keizer and Patricia Duplessis.

TABLE 1: SOIL ANALYSIS REPORT - HARTLAND 1990

Sample depth (cm)	ph	Phosphate (kg/ha)	Potash (kg/ha)	Calcium (kg/ha)	Magnesium (kg/ha)
0-15	6.3	513+	450+	2360	255
15-30	6.2	513+	450+	2191	260
30-45	6.1	513+	400+	1509	239

TABLE 2: YIELD AND AGRONOMIC CHARACTERISTICS OF DUKE UNDERSEEDING STUDY - HARTLAND 1990

Forage	Seeding Rate (kg/ha)	Yield (T/ha)	TKW (g)	Kernels/ head	Plant Height (cm)
Ryegrass (Lemtal)	25	4.4	31.6	40	67
Check		4.1	31.9	39	69
Alfalfa (Algonquin)	12	4.0	30.2	42	70
Triple Mix	10	4.0	32.2	40	69
Ryegrass (Aubade)	25	4.0	28.8	41	67
Red Clover (Double -Cut)	10	4.0	30.1	42	67
L.S.D. (.05)		0.5	4.2	7.0	4
C.V. (%)		8.0	7.9	11.3	4.3

TABLE 3: YIELD AND TKW OF BELVEDERE SPRING WHEAT UNDERSEEDING STUDY - HARTLAND 1990

Forage	Seeding Rate (kg/ha)	Yield (T/ha)	TKW (g)
Check		4.1	30.9
Ryegrass (Lemtal)	25	4.1	31.2
Alfalfa (Algonquin)	12	4.1	29.4
Triple Mix	10	4.0	30.2
Red Clover (Double-Cut)	10	3.9	28.6
Ryegrass (Aubade)	25	3.1	29.9
L.S.D. (.05)		0.3	2.3
C.V. (%)		4.8	5.1

TABLE 4: NEMATODE POPULATIONS per kg of SOIL HARTLAND 1990

BEFORE PLANTING				
	Root Lesion	Stunt	Root-Knot	Spiral
	776	309	-	-
AFTER HARVEST				
Check	5194	157	-	-
Red Clover (Double-Cut)	5026	159	-	-
Triple Mix	4092	-	-	157
Ryegrass (Aubade)	4053	157	-	-
Ryegrass (Lemtal)	3944	159	156	-
Alfalfa (Algonquin)	2832	-	157	-
L.S.D. (.05)	3879	402	282	193
C.V. (%)	61.4	253.0	357.8	489.9

EVALUATION OF TRITICALE/WHEAT, BARLEY AND OAT CULTIVARS UNDER A SUSTAINABLE PRODUCTION PROTOCOL - WOODSTOCK 1990

D.F. Walker and A.O.M. Smith

ABSTRACT: One triticale, five wheat, three barley and three oat cultivars were planted in separate trials in a R.C.B. design with four replications at Woodstock, N.B. on June 1. Yields of the triticale/wheat, barley and oat cultivars ranged from 1.1 - 0.6, 0.8 - 0.6 and 1.3 - 0.7 T/ha respectively. Lodging did not occur in any triticale/wheat plots, but was severe and even across all barley and oat plots.

ÉVALUATION DE CULTIVARS DE TRITICALE/BLÉ, D'ORGE ET D'AVOINE SOUMIS À UN PROTOCOLE DE PRODUCTION INTÉGRÉE - WOODSTOCK (1990)

Résumé: Dans des essais distincts réalisés à Woodstock (N.-B.), on a planté le 1er juin un cultivar de triticale, cinq cultivars de blé, trois cultivars d'orge et trois cultivars d'avoine dans un dispositif expérimental en bloc divisé au hasard et répété quatre fois. Les rendements variaient de 1,1 à 0,6 tonnes par hectare pour le triticale/blé, de 0,8 à 0,6 tonnes par hectare pour l'orge, et de 1,3 à 0,7 tonnes par hectare pour l'avoine. Aucune verse n'a été observée dans les parcelles de triticale/blé, mais elle était prononcée et uniforme dans toutes les parcelles d'orge et d'avoine.

INTRODUCTION: Interest in sustainable agriculture is continuing to expand as a result of increased awareness and concern about chemicals in the food supply. Sustainable methods of production do not permit the use of synthetic fertilizers, herbicides, insecticides, fungicides or growth regulators. They rely mainly on crop rotation, natural soil mineralization, the application of manures and natural fertility sources for plant nutrition. Crop damage from diseases and insect pests is achieved mainly through genetic resistance and the avoidance of monoculture crop production. Yields from organic production systems are usually lower than the more conventional systems, however, cost of production is usually lower and consumers are prepared to pay more for certified organically grown crops. Cosmetic appeal of organically produced crops is usually less than conventionally produced crops, but consumers will overlook some disease and insect damage if they know that the crops were organically grown. The purpose of this project was to determine the production potential of triticale, new and old wheat, barley and oat cultivars when grown under an organic protocol.

MATERIALS & METHODS: On June 1, at Woodstock, N.B. a Wintersteiger plot seeder was used to plant a triticale/wheat, barley and oat cultivar study. Plot designs was R.C.B. with four replications and each plot was 2m X 8.5m with a row spacing of 12 cms. All plots were underseeded with red clover (9 kg/ha) and managed according to organic protocol: no commercial fertilizers, herbicides, insecticides, fungicides, growth regulators or seed treatments were applied to the seed or growing crop. All plots were harvested with a Hege 125B plot combine on September 18. Table 1 is a soil analysis report from a sample that was collected prior to planting at three sampling depths.

RESULTS & DISCUSSION: This trial was planted on June 1, therefore yields were much lower than they would have been had seeding taken place at a more suitable date (May 1 - 10).

The triticale line, CT3, yielded significantly higher than the 5 wheat cultivars that it was included with (Table 2). This result was not unexpected as triticale, being similar to rye, has an extensive and efficient root system even when grown under a low level of management. There was no significant difference in yield of any of the wheat cultivars. It should be noted that the normal yield difference seen between eastern (Max, Belvedere, AW 117) and western cultivars (Katepwa, Roblin) completely disappeared when grown organically. Lodging did not occur in any of the triticale/wheat plots.

The three barley cultivars: Duke, Chapais and Leger yielded 0.8, 0.7 and 0.6 T/ha respectively (Table 3). Lodging was severe and even across all plots.

Three oat cultivars: Marion (a normal oat), OA 753-2 and Tibor (two hull-less oat cultivars) yielded 1.3, 0.8 and 0.7 T/ha respectively (Table 4). Lodging was severe and even across all plots.

Yields of all species, cultivars/lines with the exception of Marion oats were lower than expected. The low yields of all cultivars were due to late planting and the lower level of management. The satisfactory yield of Marion oats again indicates that this species is better adapted to sustainable production. All plots were underseeded providing competition from the mid-point on in the growing season and could possibly have reduced yields. At harvest, the Red Clover had grown up through the lodged barley and oat plots causing harvesting difficulties.

CONCLUSION: The very late planting date was the main cause of the low yields of all species in this study. The more demanding crops of wheat and barley are less able to withstand late planting dates and appear to be less suited to the lower management levels than either oats or triticale. This experiment will be continued in 1991 to further evaluate species and cultivars within species that could be adapted to the sustainable method of production.

ACKNOWLEDGEMENTS: The author wishes to thank Mack White for plot land used for this study. Appreciation is also expressed to summer staff Charles Turner, Kimberley Keizer and Patricia Duplessis.

Table 1: Soil Analysis Report - Woodstock 1990

Sample Depth (cm)	pH	Phosphate (kg/ha)	Potash (kg/ha)	Calcium (kg/ha)	Magnesium (kg/ha)
0-15	5.9	400	359	1006	163
15-30	5.7	420	322	951	145
30-45	5.8	277	213	677	106

TABLE 2: YIELD OF SPRING TRITICALE/WHEAT CULTIVARS WOODSTOCK 1990

Cultivar	Yield (T/ha)*
CT 3	1.1 a
AW 117	0.8 b
Roblin	0.7 b
Katepwa	0.7 b
Max	0.7 b
Belvedere	0.6 b
L.S.D. (.05)	0.3
C.V. (%)	22.2

* No lodging

TABLE 3: YIELD OF BARLEY CULTIVARS - WOODSTOCK 1990

Cultivar	Yield (T/ha)*
Duke	0.8 a
Chapais	0.7 a
Leger	0.6 a
L.S.D. (.05)	0.5
C.V. (%)	38.4

* Heavy rain prior to harvest caused severe lodging

TABLE 4: YIELD OF OAT CULTIVARS - WOODSTOCK 1990

Cultivar	Yield (T/ha) *
Marion	1.3 a
OA 753-2	0.8 b
Tibor	0.7 b
L.S.D. (.05)	0.3
C.V. (%)	16.9

* Heavy rain prior to harvest caused severe lodging

BARLEY, WHEAT AND OAT CULTIVAR EVALUATION GRAND FALLS 1990

D.F. Walker and A.O.M. Smith

ABSTRACT: Barley, wheat and oat yields ranged from 4.8 to 3.3, 3.7 to 2.0, and 4.1 to 2.2 T/ha respectfully. Lodging in wheat and barley was minimal while ratings in the oats ranged from a high of 8 to a low of 1. Diseases including: net blotch, spot blotch, and scald on barley, mildew and septoria on wheat, and septoria on oats were present on all cultivars.

ÉVALUATION DE CULTIVARS D'ORGE, DE BLÉ ET D'AVOINE GRAND-SAULT (1990)

Résumé: Les rendements variaient de 4,8 à 3,3 tonnes par hectare pour l'orge, de 3,7 à 2 tonnes par hectare pour le blé, et de 4,1 à 2,2 tonnes par hectare pour l'avoine. Le blé et l'orge n'ont presque pas enregistré de verse, tandis que l'avoine présentait divers taux de verse variant de 8 à 1. Les maladies observées dans les cultivars d'orge étaient la rayure réticulée, l'helminthosporiose et la tache pâle, celles présentes dans les cultivars de blé étaient le mildiou et la septoriose, et les cultivars d'avoine ont été touchés par la septoriose.

INTRODUCTION: Cultivar evaluation and adaptation trials are a labour intensive routine component of any cereal research program. The main objective of any cultivar testing program is to (a) select the highest yielding and agronomically suitable line or cultivar for a given region and (b) to demonstrate these new cultivars or lines to the producers that will eventually grow them. The Field Crop Section of the N.B. Dept. of Agriculture regards this activity as a high priority. It is only through growing the highest yielding and most agronomically suitable cultivar that farmers in N.B. can stay competitive and make a profit.

In N.B. in excess of 90% of the grain produced is used for feeding livestock and the remainder is used for seed. Of the three small grains, barley is the most widely grown followed by oats and wheat. The bulk of the barley acreage in N.B. is dominated by 6-row cultivars including: Leger, Chapais, Cadette, and Duke. Breeders have been very successful at producing high yielding, well adapted barley cultivars for eastern Canada. In the past, western cultivars were poorly adapted for N.B.; however, recently some cultivars and lines including: Duke, Samson, and BT 490 have shown excellent production potential.

Spring wheat is a minor crop in the total grain picture in N.B. with all production being sold as either seed or feed. The predominate wheat cultivar is Belvedere, which was bred at the Charlottetown Research Station. There are a number of western cultivars under test but appear to have little production potential.

Oats are still the species of choice for those farmers who are only willing to provide minimal management or have land that is unsuitable for the higher demanding crops of wheat and barley. The Ottawa breeding program is continuing their effort with hull-less oats and appear to be making excellent yield advances with the latest releases. These lines with higher yields could expand the hull-less oat production in N.B.

MATERIALS & METHODS: On May 17, a barley, spring wheat, and oat cultivar trial was planted at Grand Falls N.B. Twelve barley, eight spring wheat, and eleven oat cultivars were planted with a Wintersteiger plot seeder with 12 cm row spacings. Plot design was R.C.B. with four replications. All barley and wheat cultivars were planted at 350 v.k./m^2 and all oat cultivars were planted at 375 v.k./m^2. Prior to planting, 260 kg/ha of 19-19-19 was manually broadcast with a cyclone spreader. Blagal(840 g ai/ha), Tilt(125 g ai/ha) and Cycocel(200 g ai/ha) were applied at G.S. 12-15 (June 5) with a small plot sprayer. All barley plots were harvested on August 30 and all spring wheat and oat plots were harvested on September 12 with a Hege 125B plot combine.

RESULTS & DISCUSSION: Barley yields ranged from 3.3 to 4.8 T/ha (Table 1). Chapais, the latest 6-row release from Quebec, had the highest yield and Rodeo, the previously predominant 2-row barley had the lowest yield (Table 1). This trial tends to support other research data indicating that Chapais, Etienne and Duke are superior to the older well established cultivars of Leger, Rodeo and Helena. Lodging was not a yield determining factor in this trial; however, it does confirm that the two Charlottetown releases Albany and Micmic, do not have strong straw. The three diseases: Net Blotch, Spot Blotch and Scald were present on all cultivars. However, yield increases as a result of disease resistance were not determined (Table 1).

Spring wheat yields ranged from 3.7 to 2.0 T/ha for Belvedere and Norseman respectively (Table 2). The six western cultivars: Blue Sky, Algot, Roblin, Katepwa, Celtic and Norseman all had significantly lower yields than Belvedere. It appears that these cultivars have little production potential in N.B. Belvedere had a significantly higher yield than Max and it also possesses superior fusarium resistance. This confirms that Belvedere is the best choice for spring wheat growers in N.B (Table 2).

Oat yields ranged from 4.1 to 3.2 T/ha, with the line TO 85025 and the hull-less cultivar Tibor respectively (Table 3). There was no significant difference between the first six entries. Marion, Sentinel and OA 753-4 had significantly lower yields. Even with the lower yield, Marion is still the cultivar of choice for those oat producers requiring earliness. The two hull-less lines, OA 753-2 and Tibor have as expected much lower yields than the conventional entries. However, the line OA 753-2 shows a significant yield advance over Tibor. The two hull-less lines also had much superior lodging resistance than any of the normal entries. All cultivars had a medium to high level of Septoria infection(Table 3).

CONCLUSION: These trials support previous findings in that Belvedere spring wheat, Chapais barley and Nova, Ultima, Shaw, Capital, Baldwin and Marion oats are the superior cultivars to grow in N.B. The hull-less oat breeding program in Ottawa is continuing to produce excellent lines which could have production potential.

ACKNOWLEDGEMENTS: The authors wish to express thanks to summer staff Charles Turner, Kimberly Keizer and Patricia Duplessis.

TABLE 1: YIELD AND AGRONOMIC CHARACTERISTICS OF BARLEY CULTIVARS - GRAND FALLS 1990

Cultivar	Yield (T/ha)	Harvest Lodging (0-9)	Net Blotch (0-9)	Spot Blotch (0-9)	Scald (0-9)
Chapais	4.8 a	0	4	4	4
Etienne	4.6 a	0	3	3	3
OB 907.23	4.6 a	0	4	3	4
Duke	4.6 a	0	4	2	3
Cadette	4.6 a	0	3	5	2
Samson	4.4 ab	0	3	3	4
BT 490	4.2 ab	0	2	4	3
Leger	4.2 abc	1	5	5	4
Albany	3.8 bcd	3	6	4	3
Micmac	3.7 cd	2	6	5	3
Helena	3.4 d	0	6	5	3
Rodeo	3.3 d	1	7	5	3
L.S.D. (.05)	0.6	1	1	1	1
C.V.(%)	9.3	99.2	18.4	24.6	21.7

TABLE 2: YIELD AND AGRONOMIC CHARACTERISTICS OF SPRING WHEAT CULTIVARS - GRAND FALLS 1990

Cultivar	Yield (T/ha)	Harvest Lodging (0-9)	Mildew (0-9)	Septoria (0-9)
Belvedere	3.7 a	0	3	4
Max	3.3 b	0	3	4
Blue Sky	2.7 c	3	5	6
Algot	2.6 c	0	4	8
Roblin	2.6 c	0	5	5
Katepwa	2.5 cd	0	7	5
Celtic	2.3 d	0	4	4
Norseman	2.0 e	0	4	6
L.S.D. (.05)	0.3	0	2	1
C.V. (%)	7.3	46.4	37.4	15.6

TABLE 3: YIELD AND AGRONOMIC CHARACTERISTICS OF OAT CULTIVARS - GRAND FALLS 1990

Cultivar	Yield (T/ha)	Harvest Lodging (0-9)	Septoria (0-9)
TO 85025	4.1 a	8	5
Nova	4.1 a	6	6
Ultima	4.1 ab	5	6
Shaw	4.1 ab	7	6
Capital	4.0 abc	6	6
Baldwin	4.0 abc	6	5
Marion	3.8 bc	7	6
Sentinel	3.8 bc	5	5
OA 753-4	3.7 c	6	5
OA 753-2	2.6 d	3	6
Tibor	2.2 e	1	7
L.S.D. (.05)	0.3	2	1
C.V. (%)	5.1	19.5	9.1

BARLEY, SPRING WHEAT, OAT AND HULL-LESS OAT CULTIVAR EVALUATION - SUSSEX 1990

D.F. Walker and A.O.M. Smith

ABSTRACT: Eighteen barley, eight spring wheat, eleven oat and five hull-less oat cultivars or lines were planted at Sussex, N.B. on May 1. All barley plots were harvested on August 11 and all the wheat, oat and hull-less oat plots were harvested on August 21. Yields ranged from 4.3 - 3.6, 3.3 - 2.3, 4.3 - 2.9 and from 3.5 - 2.9 T/ha for barley, spring wheat, oats and hull-less oats respectively. Lodging had no effect on yield and only the weakest cultivars were affected. Plant heights were shorter than normal due to excess moisture early in the growing season followed by a lack of moisture.

ÉVALUATION DE CULTIVARS D'ORGE, DE BLÉ DE PRINTEMPS, D'AVOINE ET D'AVOINE NUE - SUSSEX (1990)

Résumé: Le 1er mai 1990, on a planté divers cultivars ou variétés à Sussex (N.-B.): 18 d'orge, 8 de blé de printemps, 11 d'avoine et 5 d'avoine nue. La récolte a eu lieu le 11 août dans toutes les parcelles d'orge et le 21 août dans les parcelles de blé, d'avoine et d'avoine nue. Les rendements variaient de 4,3 à 3,6 tonnes par hectare pour l'orge, de 3,3 à 2,3 tonnes par hectares pour le blé de printemps, de 4,3 à 2,9 tonnes par hectares pour l'avoine, et de 3,5 à 2,9 tonnes par hectares pour l'avoine nue. La verse n'a pas eu d'effet sur le rendement, et seuls les cultivars chétifs ont été touchés. La hauteur des plants était inférieure à la normale à cause de la trop grande humidité au début de la saison de culture, suivie d'une absence d'humidité.

INTRODUCTION: Cultivar evaluation and adaptation trials are a labour intensive routine component of any cereal research program. The main objective of any cultivar testing program is to (a) select the highest yielding and agronomically suitable line or cultivar for a given region and (b) to demonstrate these new cultivars or lines to the producers that will eventually grow them. The Field Crop Section of the N.B. Dept. of Agriculture regards this activity as a high priority. It is only through growing the highest yielding and most agronomically suitable cultivar that farmers in N.B. can stay competitive and make a profit.

In N.B. in excess of 90% of the grain produced is used for feeding livestock and the remainder is used for seed. Of the three small grains, barley is the most widely grown followed by oats and wheat. The bulk of the barley acreage in N.B. is dominated by 6-row cultivars including: Leger, Chapais, Cadette, and Duke. Breeders have been very successful at producing high yielding, well adapted barley cultivars for eastern Canada. In the past, western cultivars were poorly adapted for N.B.; however, recently some cultivars and lines including: Duke, Samson, and BT 490 have shown excellent production potential.

Spring wheat is a minor crop in the total grain picture in N.B. with all production being sold as either seed or feed. The predominate wheat cultivar is Belvedere, which was bred at the Charlottetown Research Station.

There are a number of western cultivars under test but appear to have little production potential.

Oats are still the species of choice for those farmers who are only willing to provide minimal management or have land that is unsuitable for the higher demanding crops of wheat and barley. The Ottawa breeding program is continuing their effort with hull-less oats and appear to be making excellent yield advances with the latest releases. These lines with higher yields could expand the hull-less oat production in N.B.

MATERIALS & METHODS: On May 1, a barley, spring wheat, oat and hull-less oat cultivar evaluation trial was planted at Sussex, N.B. The 18 barley, 8 spring wheat, 11 oat and 5 hull-less oat cultivars were planted using a Wintersteiger plot seeder with a row spacing of 12 cm. Plot design was R.C.B. with 4 replications. The seeding rate was 350 vk/m^2 for barley and wheat and 375 vk/m^2 for oat and hull-less oat cultivars. Table 1 is a soil analysis of a soil sample collected from the plot area at three different soil depths before planting. Prior to planting, 200 kg/ha 17-17-17 was manually broadcast with a cyclone spreader. An additional 150 kg/ha of 34-0-0 was broadcast at G.S. 30-32 (June 11). Blagal (840g ai/ha), Tilt (125g ai/ha) and Cycocel (200g ai/ha) were applied at G.S. 12-14 (May 29) with a small plot sprayer. A Hege 125B plot combine was used to harvest all barley plots on August 11 and all wheat, oat and hull-less oat plots on August 21.

RESULTS & DISCUSSION: Weather conditions were dry in late April, permitting an early planting date of May 1. Following planting, a prolonged period of cold wet weather severely stunted all crops. From approximately June 1, the weather turned hot and dry causing a slight moisture stress by mid July. These variable weather conditions reduced the three variables being tested; yield, lodging and plant height.

Barley yields ranged from 4.3 to 3.6 T/ha for BT 490 and QB 611.23 respectively (Table 2). The two cultivars, Chapais and Duke, that have a very high rating in the Field Crop Guide[1], had disappointing yields of 3.9 and 4.1 T/ha respectively (Table 2). It appears that these two cultivars suffered more from the stress of the weather conditions than some other entries. Given the stressful weather conditions and the appearance of the plants during the growing season, these yields are higher than what would have been expected (Table 2). Plant height of all cultivars was very short, ranging from 59 to 76 cm. The shortness resulted in only two cultivars having a lodging rating of greater than 1. These two cultivars were OB 907-23 and QB 611.23 with ratings of 4 and 3 respectively (Table 2). It would appear that these two cultivars suffered more from the stressful weather conditions than some of the other entries.

Yields of spring wheat ranged from 3.3 to 2.3 T/ha (Table 3). These yields are lower than expected and are undoubtably due to stressful growing conditions. The six western cultivars in this study; Norseman, Algot, Celtic, Roblin, Blue Sky and Katepwa had yields ranging from 2.9 to 2.3 T/ha (Table 3). These low yields indicate little production potential in N.B. Poor growing conditions also reduced plant height ranging from 59 to 85 cm. Short stature also led to only minimal lodging. Blue Sky had the highest lodging rating (4) indicating a lack of straw strength (Table 3). This agrees with results reported at the Grand Falls location[2].

Oat yields ranged from 4.3 to 2.9 T/ha for TO 85025 and Dal respectively (Table 4). Of the three species grown, it appears that the oats were able to withstand the stressful weather conditions best. However, plant height was shortened and lodging reduced. Nova, Baldwin and Capital, three of the most promising recent releases, were out yielded by other lines of cultivars indicating a possible weakness to withstand stressful conditions.

Hull-less oat yields ranged from 3.5 to 2.9 T/ha for OA753-2 and Tibor respectively (Table 5). Both yield and T.K.W. are close to some lower yielding normal oats (Table 4 & 5). This high yield is a major breakthrough and indicates the success of the Ottawa breeding program. Similar to the normal oats at this location, the hull-less oats appear to withstand stressful conditions better than barley or wheat.

CONCLUSION: Under stressful weather conditions, the most promising cultivars of barley and oats (based on previous data[3,4]) appear to suffer more than some other entries in the trial. The new lines of hull-less oats from the Ottawa program look very promising and should increase hull-less oat production when seed becomes available.

ACKNOWLEDGEMENTS: The authors wish to thank George Walker for plot land used for this trial. Appreciation is also expressed to summer students Charles Turner, Kimberley Keizer and Patricia Duplessis for their assistance.

REFERENCES: Field Crop Guide to Variety and Pesticide Selection for the Atlantic Provinces 1991. Publication 100A. Agdex No. 100.32 Page 4-5.

Walker, D.F. and Smith, A.O.M. 1991. Barley, Spring Wheat, Oat and Hull-less Oat Cultivar Evaluation - Grand Falls. Adaptive Research Reports, N.B. Department of Agriculture 12:

Preliminary Cereal Variety Trials 1990. Conducted by Atlantic Advisory Committee of Cereal and Protein Crops.

Advanced Cereal Variety Trials 1990. Conducted by Cooperative Cereal Testing Committees for Maritimes and Quebec.

TABLE 1: SOIL ANALYSIS REPORT - SUSSEX 1990

Sample Depth (cm)	pH	Phosphate (kg/ha)	Potash (kg/ha)	Calcium (kg/ha)	Magnesium (kg/ha)
0-15	5.9	513+	450+	2124	183
15-30	5.8	513+	450+	1997	180
30-45	5.5	513+	430+	1431	142

TABLE 2: YIELD AND AGRONOMIC CHARACTERISTICS OF BARLEY CULTIVARS - SUSSEX 1990

Cultivar	Yield (T/ha)	Harvest Lodging (0-9)	Plant Height (cm)
BT 490	4.3 a	1	64
Symko	4.2 ab	0	71
Sabina	4.2 ab	0	76
TBR 579-5	4.2 ab	0	66
Etienne	4.2 ab	0	69
Winthrop	4.1 abc	0	65
AB 97-3	4.1 abc	0	68
AB 93-2	4.1 abc	0	67
Duke	4.1 abc	0	62
Albany	4.1 abc	1	61
Rodeo	4.1 abc	0	65
OB 907-23	4.0 abcd	4	75
Helena	4.0 abcd	0	59
Chapais	3.9 abcd	1	63
Micmac	3.9 abcd	1	71
Cadette	3.8 bcd	0	62
Samson	3.7 cd	0	60
QB 611.23	3.6 d	3	73
L.S.D. (.05)	0.4	1	5
C.V. (%)	7.4	109.5	5.2

TABLE 3: YIELD AND AGRONOMIC CHARACTERISTICS OF SPRING WHEAT CULTIVARS - SUSSEX 1990

Cultivar	Yield (T/ha)	Harvest Lodging (0-9)	Plant Height (cm)
Belvedere	3.3 a	1	82
Max	3.3 a	1	80
Norseman	2.9 ab	0	59
Algot	2.8 abc	3	85
Celtic	2.6 bc	2	71
Roblin	2.5 bc	2	76
Blue Sky	2.4 bc	4	83
Katepwa	2.3 c	3	79
L.S.D. (.05)	0.5	1	4
C.V. (%)	12.7	33.9	3.5

TABLE 4: YIELD AND AGRONOMIC CHARACTERISTICS OF OAT CULTIVARS - SUSSEX 1990

Cultivar	Yield (T/ha)	T.K.W. (g)	Harvest Lodging (0-9)	Plant Height (cm)
TO 85025	4.3 a	33.1	1	86
Ultima	4.3 a	32.6	0	79
OA 753-4	4.1 ab	32.5	1	83
Marion	3.9 abc	32.5	4	90
Shaw	3.8 abc	31.3	2	82
Nova	3.7 abc	31.5	2	81
Sentinel	3.7 abc	30.1	1	84
Baldwin	3.6 bcd	32.6	2	89
Capital	3.5 bcd	29.9	1	77
Lodi	3.2 cd	33.4	1	87
Dal	2.9 d	33.2	1	74
L.S.D. (.05)	0.7	3.8	1	8
C.V. (%)	12.6	8.2	47.4	6.7

TABLE 5: YIELD AND AGRONOMIC CHARACTERISTICS OF HULL-LESS OAT CULTIVARS - SUSSEX 1990

Cultivar	Yield (T/ha)	T.K.W. (g)	Harvest Lodging (0-9)	Plant Height (cm)
OA 753-2	3.5 a	34.6	3	87
OA 825-3	3.4 a	35.8	1	93
OA 826-3	3.4 ab	33.9	1	89
OA 820-3	3.2 b	31.5	2	87
Tibor	2.9 c	35.4	1	92
L.S.D. (.05)	0.2	1.7	1	6
C.V. (%)	3.9	3.2	51.0	4.1

EFFECT OF NITROGEN ON REED CANARYGRASS

BY

C.H. McLean, A.O.M. Smith and L.M. Nason

ABSTRACT: Increased nitrogen levels on Venture and Palaton reed canarygrass varieties, resulted in increased dry matter yields and crude protein yields. No significant difference was observed between varieties.

EFFET DE L'AZOTE SUR L'ALPISTE ROSEAU

Résumé: L'application accrue d'azote sur les variétés d'alpiste roseau Venture et Palaton ont augmenté les rendements de matière sèche et de protéines brutes. Aucun écart important n'a été observé entre les variétes.

INTRODUCTION: Reed canarygrass (*Phalaris arundinacea*) has long been recognized as a vigorous species with considerable growth potential, but has met with limited acceptance due to certain anti-quality characteristics. Older varieties had high alkaloid levels, which decreased palatability and animal performance. Interest in the production of reed canarygrass has increased in recent years with the introduction of new cultivars.

Because of its tolerance of wet soil conditions, reed canarygrass has traditionally been grown on poorly drained soils. Although the crop thrives under these conditions it is often difficult or impossible to harvest or graze the plants at the proper time.

To better evaluate the potential of the species, a trial was established in Grand Falls to assess the response of two varieties of reed canarygrass to various levels of nitrogen fertility.

MATERIALS AND METHODS: Two reed canary grass cultivars, Venture and Palaton, were seeded at Grand Falls, N.B. on June 5, 1989 at 12 kg/ha, in a split plot design with 4 replications using a Wintersteiger plot seeder. Each sub-plot measured 2 X 8.5m. On June 20, 1989 an application of 15-15-15 was broadcast at 400 kg/ha. During the first year, the plots were clipped for weed control with no yield data taken.

On May 17, 1990 an application of 0-46-60 at 425 kg/ha was manually broadcast on all plots with a cyclone spreader. Nitrogen was applied as ammonium nitrate at 0, 20,40,60 kg actual N/ha on May 17, July 12 and August 30 1990. Three harvests, (June 5, July 12, August 30) were taken during 1990, using a flail type plot harvester.

Yield of each sub-plot was determined, and sub-samples were submitted for laboratory analyses.

RESULTS AND DISCUSSION: Dry matter yields for the total of three cuts are presented in Table 1. No significant difference between varieties was observed. Differences were observed among nitrogen levels for each variety, and for the mean of both varieties at different levels of nitrogen. No significant difference was detected between the 20 kg/ha and 40 kg/ha rates, but all other applications produced significantly different yields.

The same trend was shown in crude protein yield, as shown in Table 2. Again no difference was detected between varieties, but the 0 kg/ha rate of nitrogen produced crude protein yields lower than the others, while the 60 kg/ha produced higher crude protein yields than all others. No difference was detected between the rates of 20 kg/ha and 40 kg/ha.

These data show that current varieties of reed canarygrass respond well to nitrogen fertility, and that crude protein percentage and yield are acceptable under proper management.

TABLE 1: EFFECT OF NITROGEN ON TOTAL DRY MATTER YIELD OF REED CANARYGRASS (kg/ha)

	kg actual N/ha per application				
Variety	0	20	40	60	Variety Mean
Venture	2820^{A}	3790^{B}	3950^{B}	4730^{C}	$3820^{N.S.}$
Palaton	3030^{A}	3850^{B}	4020^{B}	5200^{C}	$4030^{N.S.}$
N Means	2930^{A}	3820^{B}	3990^{B}	4960^{C}	

L.S.D.	(.05)
Between variety means	N.S.
Between nitrogen means	440
Between nitrogen means for same variety	620
Between variety means for same nitrogen level	410

*Means followed by the same letter are not significantly different.

TABLE 2: EFFECT OF NITROGEN ON TOTAL CRUDE PROTEIN YIELD OF REED CANARYGRASS (kg/ha)

	kg actual N/ha per application				
Variety	0	20	40	60	Variety Means
Venture	414^{A}	601^{B}	663^{B}	663^{C}	626$^{N.S}$
Palaton	425^{A}	607^{B}	666^{B}	877^{C}	646$^{N.S.}$
N Means	419^{A}	604^{B}	664^{B}	838^{C}	

L.S.D.	(.05)
Between variety means	N.S.
Between nitrogen means	93
Between nitrogen means for the same variety	67
Between variety means for the same nitrogen level	115

*Means followed by the same letter are not significantly different.

CONCLUSIONS: The reed canarygrass varieties, Venture and Palaton, responded well to increased nitrogen inputs. Increases in dry matter yield and crude protein yield were observed with higher levels of nitrogen, but no differences were observed between varieties.

This species provided adequate levels of high protein forage when grown on a well drained soil. Further analysis is needed to determine alkaloid levels of these cultivars under New Brunswick conditions. Grazing trials are required to determine the acceptability of the forage to livestock. The feasibility of growing reed canarygrass in mixtures with legumes also warrants investigation.

VERTICILLIUM WILT RESISTANT ALFALFA VARIETY EVALUATION

C.H. McLean, A.O.M. Smith and L.M. Nason

ABSTRACT: Ten on-farm demonstrations were established throughout New Brunswick to assess the resistance to Verticillium Wilt and persistence of fifteen varieties. A replicated trial to evaluate eleven of these varieties was established in Grand Falls in 1989. No significant differences were found in total yield, but differences in protein yield were detected. Stands will be monitored for disease level in 1991.

ÉVALUATION DE VARIÉTÉS DE LUZERNE RÉSISTANTES À LA FLÉTRISSURE VERTICILLIENNE

Résumé: Dix démonstrations à la ferme ont été organisées dans l'ensemble du Nouveau-Brunswick pour évaluer la rémanence et la résistance à la flétrissure verticillienne de 15 variétés de luzerne. Un essai semblable a été organisé à Grand-Sault en 1989. On n'a pas relevé d'écart important dans le rendement total, mais des écarts ont été observés dans le rendement de protéines. On vérifiera la présence de maladies dans les plants en 1991.

INTRODUCTION: Verticillium wilt is one of the most potentially destructive diseases of alfalfa. It is widespread throughout the major seed producing areas of the northwestern United States. It was first identified on farms in Western Canada in 1976 and has spread rapidly since that time. A survey conducted in 1980-81 detected the disease in British Columbia, Alberta, Saskatchewan, Ontario, and Nova Scotia. Measures such as seed treatment and certification of seed lots, aimed at preventing introduction of the disease into new areas, appeared effective. In 1986, federal regulations requiring seed treatment of alfalfa were removed. In 1988, surveys in New Brunswick, Prince Edward Island and Nova Scotia identified the disease in many locations.

Verticillium wilt of alfalfa is caused by the fungus _Verticillium albo-atrum_. Different strains of Verticillium attack other crops such as potatoes and strawberries, but these strains do not affect alfalfa.

The most effective means of combatting Verticillium Wilt is to plant varieties with resistance to the disease. At the time of outbreak in N.B., none of the varieties recommended in the region had adequate resistance.

A project was undertaken to determine the adaptability of improved varieties with varying degrees of verticillium wilt resistance. Large scale plots were established on several farms throughout the province in 1989 and 1990. A replicated trial was established in Grand Falls in 1989 with eleven varieties. A total of fifteen varieties were demonstrated on farms, with individual sites demonstrating three to eight varieties each.

MATERIALS AND METHODS: Seed of a total of fifteen varieties was distributed to ten farms throughout the province in the spring of 1989 and 1990. Individual farmers established from three to eight varieties, withe the sites ranging from to three to six hectares in size.

Eleven alfalfa varieties were planted at Grand Falls, N.B. on June 5, 1989 with a Wintersteiger plot seeder at a seeding rate of 12 kg/ha. Plot design was R.C.B. with four replications and each plot was 2 X 8.5m. Prior to planting, seed was inoculated with the proper rhizobia. Before planting, the pH was 6.5 and phosphorus and potash were in the very high range. All plots were clipped twice for weed control in the establishment year with no yield data collected. In the fall of 1989, potash was applied according to soil test recommendation.

On May 17, 1990, an application of 425 kg/ha 0-46-60 was manually applied with a cyclone spreader. The plots were harvested on June 25 and August 13, 1990 with a Rem plot harvester, and yield data collected. Sub-samples were submitted for laboratory analysis. Potash was applied according to soil test results after the second harvest.

RESULTS AND DISCUSSION: Total dry matter yield of the eleven varieties established in Grand Falls are shown in Table 1. No significant differences in yield were detected.

No significant level of verticillium wilt was detected in 1990. It was the first time that alfalfa had been grown on this site, and little alfalfa is grown in the immediate vicinity, so disease pressure was low. As it is more common for the disease to manifest itself in the second and third harvest years, the plots will be monitored in 1991 for presence of verticillium wilt.

Table 2 shows total crude protein yields. Two varieties, Pioneer 5432 and Centurion, showed lower total protein yields, as a result of their lower first cut protein levels. This may be due to advanced maturity of these varieties, and does not necessarily mean that they would perform likewise in a farm situation if they were harvested according to stage of development.

Table 3 lists the varieties demonstrated on farm, including newer varieties with verticillium wilt resistance, and older varieties for comparison purposes. These sites will be monitored in 1991 for persistence and disease levels.

Table 4 indicates the locations and year of establishment of the on-farm demonstrations. Farmers interested in viewing these varieties under field conditions should contact the grower involved.

TABLE 1: DRY MATTER YIELD (kg/ha)

Variety*	JUNE 25	AUGUST 13	TOTAL
Ultra	3760	2130	5890
Apica	3650	2180	5840
WL 316	3670	1940	5610
Sparta	3510	2090	5590
Arrow	3550	2030	5590
Ambassador	3350	2220	5580
Algonquin	3650	1930	5570
Pioneer 5432	3460	2110	5570
DK 125	3360	2140	5500
Minto	3590	1860	5450
Centurion	3290	2010	5300
L.S.D. (.05)	500 (N.S.)	380 (N.S.)	660 (N.S.)
C.V. (%)	9.9	12.8	8.2

*Varieties ranked based on total yield

TABLE 2: CRUDE PROTEIN YIELD (kg/ha)

Variety*	JUNE 25	AUGUST 13	TOTAL
Apica	760	500^A	1260^A
Sparta	677^A	491^A	1168^A
Ultra	685^A	481^A	1167^A
Arrow	708^A	452^A	1160^A
Algonquin	702^A	454^A	1156^A
DK 125	684^A	462^A	1145^A
WL 316	707^A	421^A	1128^A
Minto	687^A	403^A	1090^A
Ambassador	603^B	485^A	1088^A
Pioneer 5432	626^B	438^A	1063^B
Centurion	621^B	436^A	1057^B
L.S.D. (.05)	106	130	176
C.V. (%)	10.8	17.1	10.8

*Varieties ranked based on total yield

**Means followed by the same letter are not significantly different

TABLE 3: ALFALFA VARIETIES DEMONSTRATED

1. Algonquin
2. Ambassador
3. Apica
4. Arrow
5. Centurion
6. DK 125
7. Iroquois
8. Minto
9. Oneida VR
10. Pioneer 5432
11. Saranac
12. Sparta
13. Ultra
14. Verta Plus
15. WL 316

TABLE 4: ON FARM DEMONSTRATIONS

Name	Location	Establishment Year
Garnet Donnelly	Lake George	1989
Gerrit Groenenberg	Hoyt	1989
Roy McCullum	Sussex	1989
Mike Mullen	Moncton	1989
Pierre Laviolette	Charlo	1989
Patrick Riordan	Pokeshaw	1989
Lamarche & Furlotte	St. Quentin	1989
Bob Parkenson	Woodstock	1989
Bonar Morton	Rexton	1990
Joe Connors	Scoudouc	1990

CONCLUSIONS: No significant infestation of Verticillium Wilt was noted in 1990. Individual demonstration sites and the replicated trial will be monitored in 1991 to evaluate disease level and persistence.

PASTURE MANAGEMENT SYSTEMS FOR BEEF

C.M. McLean, A.O.M. Smith and L.M. Nason

ABSTRACT: Various annual and perennial forage species were established as pastures. Sixty crossbred beef heifers were weighed periodically throughout the season. Average daily gain over the season was 1.9 lbs/day, with individual average daily gain ranging from 1.1 - 2.5 lbs/day. Perennial mixtures established will be further evaluated under grazing conditions in 1991.

SYSTÈMES D'AMÉNAGEMENT DES PÂTURAGES POUR LES BOVINS

Résumé: Des pâturages ont été établis avec diverses variétés fourragères annuelles et vivaces. Soixante génisses croisées de race à viande ont été régulièrement pesées durant la saison. Le gain moyen a été de 1,9 livre par jour en moyenne pour toute la saison, et le gain quotidien individuel variait de 1,1 à 2,5 livres par jour en moyenne. Les variétés vivaces établies seront évaluées de nouveau durant la saison de pâturage de 1991.

INTRODUCTION: Interest in improved pasture management techniques has increased in recent years. Costs of producing high quality stored forages or feed grains have caused many producers to take a second look at pasture as an economical means of producing livestock gains.

New Brunswick is ideally suited to pasture production. Considerable cleared land currently exists which may have limited adaptability to other crops, but may be used for grazing with much lower investment.

To better determine the potential of improved pasture management, trials were established in 1989 and 1990 at the farm of Joe Connors, Shediac, to evaluate the performance of beef cattle on various types of pasture, with the objective of providing high quality feed to the livestock throughout the grazing season.

MATERIALS AND METHODS: In 1990 grazing trials were established using 60 crossbred heifers, which were rotated on various types of pasture throughout the season. Pastures consisted of the following:

(1) 14 acres permanent pasture
(2) 3 acres annual ryegrass/Persian clover
(3) 3 acres annual ryegrass
(4) 20 acres meadow fescue/orchard grass/Sonja white clover(1989 seeding)
(5) 6 acres perennial mix underseeded to annual ryegrass(1990 seeding) including Gunne perennial ryegrass, Orchard grass, Meadow Fescue, and Sonja white clover

The herd was put on pasture May 22, and individual animal weights recorded using a Paul portable scale. The pastures were divided using a battery operated fencer and a single strand of poly wire, with the animals moved according to residual height of the pasture.

A heavy coat of manure was incorporated prior to both 1989 and 1990 seedings. Fertilizer was applied according to soil test, with an additional application of 150 kg/ha urea (45-0-0) applied to the annual ryegrass after the first grazing.

An additional trial was seeded within one paddock in 1990 to assess various perennial species in pure stand and mixtures. The species sown in pure stand are listed in Table 1. These plots measured 4.0 X 8.5m. Table 2 shows the mixtures sown. These mixtures were sown in a split-plot design with 4 replications. One half of each plot was underseeded to Lemtal annual ryegrass at 15 kg/ha, with the other half direct-seeded to the mixture. Each sub-plot measured 2.0 X 8.5m.

RESULTS AND DISCUSSION: The various species shown in Table 1 will be evaluated for winter survival in the spring of 1991. They will also be subjected to grazing by beef animals to determine their grazing tolerance and regrowth.

The mixtures shown in Table 2 will be evaluated for persistence in the spring of 1991. They will be further evaluated for the following:

(1) Yield and quality.
(2) Grazing tolerance and regrowth.
(3) Effect of including annual ryegrass on establishment of mixtures.

The starting weights and average daily gains of the 60 crossbred heifers are shown in Table 3. Weight gains were considered very good for the season. Pasture productivity was excellent, given the extended mid-summer dry periods.

Table 4 shows the quality of various pastures in the fall period , as determined by laboratory analysis. This indicates that with good rotational grazing practices, excellent quality forage can be provided late into the season.

TABLE 1: PERENNIAL SPECIES

Mimer Meadow Fescue
Kay Orchard Grass
Frode Orchard Grass
Baylor Brome
Kenhy Fescue Hybrid
Triple Mix
Alsike Clover
Gunne Perennial Ryegrass
Bastion Perennial Ryegrass
Sonja White Clover
Sacramento Ladino Clover

TABLE 2: PERENNIAL PASTURE MIXTURES

(1) Mimer Meadow Fescue
Frode Orchard Grass
Sonja White Clover
(2) Gunne Perennial Ryegrass
Mimer Meadow Fescue
Frode Orchard Grass
Sonja White Clover
(3) Bastion Perennial Ryegrass
Mimer Meadow Fescue
Frode Orchard Grass
Sonja White Clover
(4) Gunne Perennial Ryegrass
Mimer Meadow Fescue
Sonja White Clover
(5) Gunne Perennial Ryegrass
Sonja White Clover
(6) Champ Timothy
Double-Cut Red Clover

**All mixtures were underseeded with Lemtal Annual Ryegrass

TABLE 3: AVERAGE CATTLE WEIGHTS AND GAINS (LBS.)

	May 22	July 20	Aug 20	Nov 13
Average wt.	469	594	665	803
Average gain*	-	125	71	138
A.D.G.	-	2.2	2.3	1.6
A.D.G. over season	-	-	-	1.9

*Average gain from previous weighing

TABLE 4: PASTURE QUALITY DURING FALL PERIOD - OCT 30

Pasture	% Crude Protein	TDN
Annual Ryegrass	31.6	75.3
AAnnual Ryegrass/Persian Clover	31.3	77.2
Meadow Fescue/Orchard Grass/ Sonja White Clover	31.6	77.1

CONCLUSIONS: Following proper rotation practices provided good quantities of high quality feed and very good animal gains throughout the season. This had an especially marked effect on forage quality in the fall period.

Further studies are needed to determine seasonal fluctuations in pasture productivity and quality, and to establish profitability of beef production on pasture over a longer period of time.

PESTICIDES

AN ECONOMICAL WINTER STORAGE FOR LIQUID PESTICIDES.

K. Lynch and M.Mann

Abstract: Winter storage of liquid pesticides is a problem for many small New Brunswick farms. Using a dysfunctional deep freeze an inexpensive storage unit can be constructed utilizing two incandescent light bulbs and a thermostat to maintain a proper storage temperature. During the test period this type of storage unit was able to maintain a 7 degree C storage temperature even when ambient temperatures dropped to - 18 degrees. Operating and construction costs were very economical.

MOYEN ÉCONOMIQUE D'ENTREPOSER LES PESTICIDES LIQUIDES EN HIVER

Résumé: Un grand nombre de petites entreprises agricoles du Nouveau-Brunswick ont de la difficulté à entreposer les pesticides liquides en hiver. Il est possible de transformer à peu de frais un congélateur désaffecté en unité de stockage en installant deux ampoules de lampe à incandescence et un thermostat pour maintenir une bonne température d'entreposage. Durant l'essai, une unité de stockage de ce genre a maintenu une température de 7 °C, même lorsque la température extérieure était de -18 °C. Les coûts de construction et de fonctionnement sont très bas.

Introduction: During the winter months up to 30 percent of New Brunswick farmers store pesticides in their house (Reissner, 1988). Most farmers feel they have little option in this as liquid pesticides will not tolerate freezing and the costs of maintaining a separate, heated storage are prohibitive. The practice however, is illegal and undesirable. Even with tightly capped containers there is some escape of the chemical into the house, spills will result in serious contamination and in the event of fire the smoke will be toxic. The following describes a pesticide storage that can be assembled for a very modest sum that will provide adequate storage area for liquid pesticides left over at the end of the season.

Materials: 2 ceramic light bulb fixtures, 2 incandescent 60 watt bulbs, 1 conventional baseboard thermostat capable of a 7 degree C setting, flat 16 gage wire including plug, solderless connectors, hasp, pad lock, chemical storage sign or decal, and an abandoned or dysfunctional deep freeze.

Methods: Old deep freezes have several attributes which make them suitable for winter storage of liquid pesticides, or, for a small farm, year round storage of all pesticides. The gasket seal on the lid and insulation enable the unit to be used in an unheated structure with only a small amount of energy required to maintain temperatures above freezing. The internal lining in most units will contain a spill, the large horizontal lid allows easy access and the unit can easily be equipped with a lock. Perhaps of most importance, broken units can usually be obtained for free or for a very nominal charge from refrigeration repair companies.

To construct the heating unit attach an electric baseboard thermostat and two junction boxes to a piece of 2 by 6 lumber approximately 20 cm long. Connect the black wire from the plug to the thermostat wire which is normally designated L1 (figure 1). To the T2 wire coming from the thermostat attach 2 wires and secure them to the junction boxes. Connect one of these wires to each of the ceramic light bulb holders. From the other terminal of each holder attach a piece of wire and then connect these two wires to the white wire of the plug. Secure the ceramic light holders to the junction box. Use solderless connectors of the appropriate size for all connections. Fasten this heating unit securely to the inside of the freezer so that the light bulbs are not in contact with any surfaces. Run the plug wire out through the back of the freezer between the lid and base gaskets. Plug in the heating unit and set the thermostat to 7 degrees C. Most thermostats will drop two to three degrees before coming on. Although one bulb will maintain the desired temperature both bulbs will be lit when the thermostat calls for heat, with this arrangement there is some security against the pesticides freezing if a single bulb burns out. Attach the hasp to the unit and secure with the pad lock. Mount a Chemical Storage sign to the unit (available from the New Brunswick Department of the Environment). Check the unit routinely during the winter to ensure proper operation. **DO NOT PURCHASE OR RETAIN AN OLD FREEZER THAT CAN NOT BE OPENED EASILY FROM THE INSIDE BY A SMALL CHILD.**

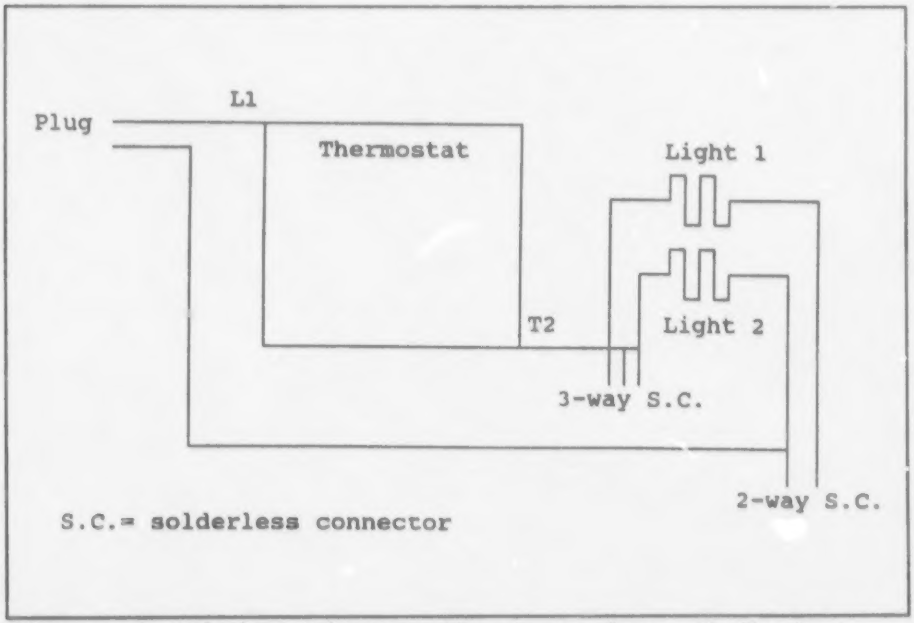


Figure 1: Wiring Diagram For Incandescent Heater

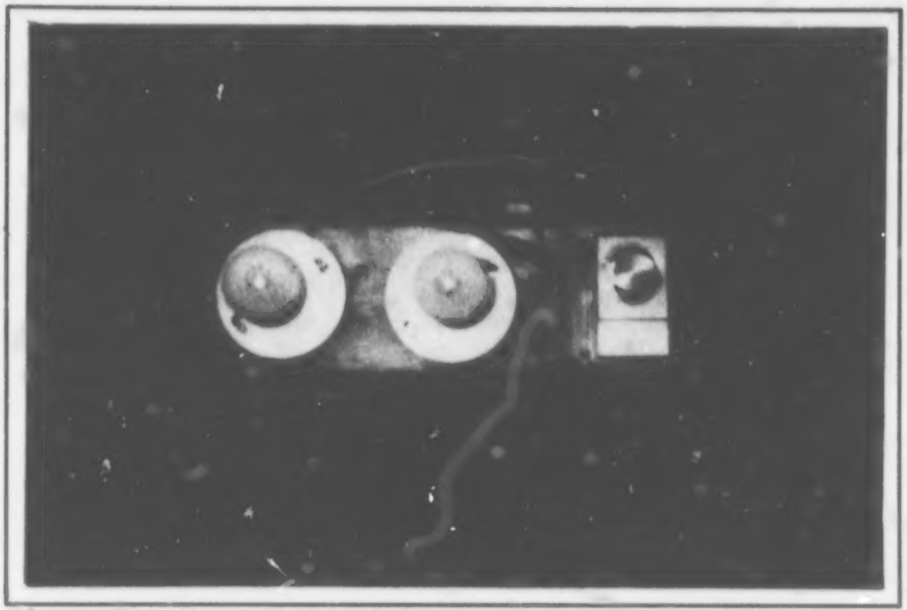


Figure 2: Incandescent Heater

Results: A unit constructed as described was installed in an unheated structure at Fredericton from December 13 to January 7. Temperatures where monitored every 2 hours outside the structure, inside the structure but outside the freezer and inside the freezer using a Campbell Scientific CR21 micrologger. The heating unit appeared to have ample heating capacity to maintain the set temperature of 7 degrees C. The coldest temperature was recorded on January 4 when the outside temperature reached - 20 and the temperature inside the unheated structure reached - 18. Under these conditions the temperature inside the freezer unit was maintained at 7 degrees with the heating unit operating about 50 percent of the time. When temperatures declined rapidly there appeared to be a lag period before the heating unit reestablished the set temperature but at no time did temperatures drop below 2 degrees.

Conclusions: The modified freezer was an economical storage to construct and operate. It was easy to access and met the requirements for safe pesticide storage. It also provides a recycled use for a product that would otherwise contribute to sanitary landfill.

References:

Reissner G., 1988, Survey of the Health and Safety of Dairy Farmers and Small Fruit/Vegetable Farmers in New Brunswick, Published by the New Brunswick Farm Safety Committee-New Brunswick Department of Agriculture.

EVALUATION OF HERBICIDES FOR FIRST YEAR APPLE ORCHARDS

K.V.McCully, D.O. Hanscomb, M.A. Mann

ABSTRACT: A trial to evaluate herbicides on first year apple orchards was conducted under New Brunswick growing conditions. Visual ratings on crop tolerance and weed control were collected in addition to tree circumferences and leader growth. Results indicated that no crop injury was observed from any treatment at any rating period. Leader growth from all treatments were significantly higher than the untreated control but not from each other. All treatments increased tree circumferences as compared to the control but only the oxadiazon treatment resulted in a significant increase. All treatments resulted in significant weed control. Oxadiazon was the best overall treatment evaluated, but metribuzin and simazine treatments can also be used safely and effectively in first year apple orchards grown in New Brunswick.

ÉVALUATION D'HERBICIDES POUR LES VERGERS D'UN AN

Résumé: On a fait l'évaluation d'herbicides dans certains vergers d'un an au Nouveau-Brunswick. L'essai comprenait l'évaluation visuelle de la tolérance des pommiers et du taux de répression des mauvaises herbes, et l'on a mesuré la circonférence des arbres et la croissance du bourgeon terminal. Les résultats ont indiqué que tous les traitements n'endommagent pas les arbres à n'importe quelle période d'évaluation. La croissance des bourgeons terminaux a été beaucoup plus considérable chez les arbres traités que chez les arbres témoins non traités, mais il n'y avait pas de différence d'un traitement à l'autre. La circonférence des arbres était plus grande chez les sujets traités que chez les arbres témoins non traités, mais seul l'oxadiazon a augmenté la circonférence de façon marquée. Tous les traitements ont été très efficaces pour la répression des mauvaises herbes. L'oxadiazon a donné les meilleurs résultats dans l'ensemble, mais le métribuzin et le simazine sont également efficaces et sans risque pour les vergers d'un an au Nouveau-Brunswick.

INTRODUCTION: Weed control can be very detrimental to the growth and development of young trees, and cannot be over emphasised (Jensen and Embree, 1983). Until recently no residual herbicides have been registered for use in the planting year. The only options were mechanical cultivation, hoeing, and paraquat(Gramoxone) spot applications.

Last year, two new herbicides were registered through the minor use program for weed control in first year orchards. These products, simazine and metribuzin were never tested under New Brunswick growing conditions. It was therefore felt that these products should be assessed before being recommended. As a result a trial was established to evaluate these two products, in addition to a third unregistered product (oxadiazon), for weed control and tree tolerance in the planting year.

MATERIALS AND METHODS: Macintosh saplings were planted May 3, 1990 in a trial at Jemseg, Queen's County. The soil type was a sandy loam with a pH of 5.8. Trees were planted at a spacing of 3.65m x 6.1m. Experimental design was a randomized complete block with four replicates. Plot size was 3m x 7.2 m with two trees per plot. Previous crop was strawberries. Metribuzin was applied preplant incorporated (PPI) May 3 and incorporated 7.5 cm with a roto-tiller. Simazine and oxadiazon were applied preemergence (PRE) on May 3, after planting. Herbicides were applied using a CO_2 backpack sprayer in a water volume of 250 L/ha. Sprayer pressure was 200 kPa. Rainfall was 2.8 mm seven days prior to application and 90 mm fourteen days after. Visual evaluations on crop phytotoxicity and weed control were taken June 28 and August 20. Tree circumference was measured May 5 and August 20. Leader growth was measured August 20. Arcsin transformations were performed where necessary on visual evaluations and logarithmic transformations were performed on the measurements. Means were separated by Duncan's multiple range test.

CROP TOLERANCE: The apple trees were very tolerant to all treatments tested, as no injury was observed from any treatments throughout the summer. Measurements of tree circumference and leader growth further supported this and indicated that increased growth actually occurred (see table 1).

Tree circumferences measured at planting were not significantly different from each other indicating their uniformity. Circumferences measured August 20 (107 days after application) indicated that all treatments tree circumferences increased as compared to the untreated control. The only treatment which was significantly higher than the untreated control,however, was oxadiazon(see table 1).

In addition, all treatments resulted in significant leader growth increases as compared to the untreated control. They were however, not significantly different from one another. This indicated that the herbicides were reducing weed pressure and giving the apple trees the opportunity to grow with this reduced competition.

WEED CONTROL: Major weeds present in plots included lamb's quarters, lady's thumb, hempnettle, vetch, sheep sorrel, redroot pigweed and barnyard grass. By the June 28 assessment date (56 days after application) all treatments resulted in significant weed control as compared to the untreated control plot. Oxadiazon resulted in the best overall weed control(96.5%) but was not significantly higher than metribuzin (83.2%). It was significantly higher than simazine (68.8%), however(see table 1).

By the August 20 assessment date (109 days after application) all treatments continued to result in significant weed control as compared to the untreated control (see table 1). Control levels were lower however, as residual activity decreased. Oxadiazon continued to be the most effective treatment(72%). Metribuzin residual activity was the lowest of the treatments tested as it now provided less weed control than simazine and significantly less control than oxadiazon.

CONCLUSION: Apple trees were very tolerant to the herbicides tested, as no tree injury was observed at any period throughout the summer. Good weed control promoted tree growth as untreated plots had the lowest tree circumference and leader lengths. Leader length increases were significantly higher than the control for all treatments. Tree circumferences were also higher than the control for all treatments, but not always significantly. Oxadiazon resulted in the best overall weed control and tree growth. Trial results indicate that although the two newly registered herbicides, metribuzin and simazine were not quite as effective as oxadiazon, they can be safely used under New Brunswick growing conditions. These products can promote tree growth in the planting year as compared to no herbicides and weed control.

REFERENCES: Jensen,K. and Embree, C. Guide to Chemical Weed Control In Orchards. Atlantic Provincres Agricultural Services Cooridinating Committee .Pub. No. Acc-1211, Agdex:210/641.

ACKNOWLEDGEMENTS: Appreciation is expressed to Alan D'aoust for providing the trial site.

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Table 1: Visual Evaluations, Circumferences and Leader Growth

TREATMENT	RATE Kg(a.i.)/ ha	APPLE TREE CIRCUMFERENCE (cm)		LEADER GROWTH CM AUG. 20	CROP DAMAGE JUNE 28	weed control	
		MAY 5	AUG 20			JUNE 28	AUG.20
Control	0	4.41 N.S.	4.41 b	51.6 B	0 N.S.	0 c	0 c
Metribuzin	0.75	4.69	5.14 ab	79.9 A	0	83.2 ab	42 b
Simazine	1.5	4.19	4.95 ab	81.5 A	0	68.8 b	53 ab
Oxadiazon	3.0	4.75	5.51 a	81.1 A	0	96.5 a	72 a

Means with the same letter are not significantly different according to Duncans Multiple Range Test.

TANSY RAGWORT CONTROL IN PASTURES

K.V. McCully, M.A. Mann, D.O. Hanscomb

ABSTRACT: A trial was established to evaluate various herbicides on their efficacy in controlling tansy ragwort (Senecio jacobaeae L.) in pastures. Tansy ragwort visual control ratings and counts were collected in addition to grass and alfalfa tolerance ratings. Results indicated that clopyralid was the most effective treatment for controlling tansy ragwort in grass pasture. It was not significantly better than 2,4-D L.V. ester + dicamba, 2,4-D L.V. ester, 2,4-D + dicamba, 2,4-D amine or dicamba, however. All of these treatments provided over 85% control. None of the treatments which controlled tansy ragwort could be used if alfalfa was present, as it was severely injured by all these treatments.

RÉPRESSION DU SÉNEÇON JACOBÉ DANS LES PÂTURAGES

Résumé: Un essai a été réalisé afin d'établir l'efficacité de divers herbicides pour la répression du séneçon jacobé (Senecio jacobaeae L.) dans les pâturages. On a fait l'évaluation visuelle et le dénombrement de cette mauvaise herbe, en plus de déterminer la tolérance des graminées et de la luzerne. Les résultats ont indiqué que le clopyralide était le produit le plus efficace pour réprimer le séneçon jacobé dans un pâturage de graminées. Toutefois, il n'était pas beaucoup plus efficace que l'ester 2,4- D L.V. + dicamba, l'ester 2,4-D L.V., le 2,4-D + dicamba, le 2,4-D amine ou dicamba. Tous ces traitements ont éliminé plus de 85 p. 100 de la mauvaise herbe. Aucun des herbicides efficaces contre le séneçon jacobé ne pourraient être utilisés en présence de la luzerne, car cette culture a été gravement endommagée par tous ces traitements.

INTRODUCTION: Tansy ragwort is a biennial or short-lived perennial weed found in some New Brunswick pastures. It is particularly of concern in the Sussex area. Alkaloids make the weed toxic to livestock, whether it is fresh, in hay or in silage. Cattle normally try to avoid the plant in pastures but once in silage or hay have a harder time distinguishing it. Dense infestations may also reduce pasture yields by over 50% (Thomson and Harris 1986).

A trial was therefore established in the Sussex area to evaluate both registered and experimental products on their effectiveness in controlling tansy ragwort in pastures. Treatments were applied either alone or in tank mixes with each other.

MATERIALS AND METHODS: The trial was established in Sussex, King's County in a loam soil with a pH of 6.0 and an organic matter content of 5%. Experimental design was a randomized complete block with four replicates. Plot size was 2m*6m. Post emergence (Post) herbicides (see table 1) were applied May 15, 1990 when the tansy ragwort was at the 3-4 rosette leaf stage. Herbicides were applied using a CO_2 backpack sprayer in a water volume of 300 L/ha at a pressure of 200 kPa. Rainfall was 78 mm, 7 days prior application and 70 mm, 7 days after. Visual assessments on crop phytotoxicity and weed control were collected June 8, July 26, and August 20. Tansy ragwort counts were collected over the entire plot area on May 15, prior to application, and again on September 5. Plots were mowed June 28. Arcsin transformations were performed on the visual evaluations where required ,and logarithmic transformations were performed on the densities. Analysis of variance was performed on all data and means separated by Duncan's multiple range test.

RESULTS AND DISCUSSIONS: All treatments except MCPB/MCPA and 2,4-DB resulted in significant tansy ragwort injury when assessed June 8 (24 days after treatment). DPX 79406 (73.3%) and DPX R9674 (66.3%) resulted in the highest levels of injury at this time.

After plots were mowed (June 28) results changed somewhat. Control was much better and longer term for all the 2,4-D, dicamba and clopypralid treatments following the mowing. For example, tansy ragwort plants treated with clopyralid looked only slightly injured after being sprayed (June 8 - 28.8%). However, after being mowed control was 100%. This indicated that the product had translocated to the root and was preventing regrowth. This was true for the 2,4-D and dicamba treatments as well. DPX 79406 and DPX R9674, although providing high initial tansy ragwort injury levels, did not translocate as well.As a result tansy ragwort recovered and regrowth resulted following mowing (See Table 1).

By the final assessment date (Aug. 20) plots treated with DPX 79406, MCPB/MCPA and 2,4-DB resulted in control levels not significantly different from the untreated plots. These were also the only treatments whose tansy ragwort density counts increased over the season (see Table 1). Treatments resulting in over 85% control included clopyralid (100%), 2,4-D L.V. ester + dicamba (100%), 2,4-D L.V. ester (96.3%), 2,4-D + dicamba (95%); 2,4-D amine (88.8%) and dicamba (87.5%). These treatments were not significantly different from one another, however.

Initial significant grass injury was observed from all treatments except MCPB/MCPA and 2,4-DB. DPX 79406 (80.0%) and DPX R9674 (57.5%) resulted in the highest initial levels of injury (see table 1). The injury from DPX 79406 was expected as it is being developed for grass control in corn. Following harvest both natural and wild grasses regrew in plots. By the final assessment (August 20) no injury was observed in any of the treated plots.

Some alfalfa was present in plots, and its tolerance was also assessed. Treatments of which alfalfa was tolerant to included 2,4-DB, DPX R9674, DPX 79406 and MCPB/MCPA. All the 2,4-D, dicamba and clopyralid treatments resulted in high levels of alfalfa injury, as expected.

CONCLUSIONS: Based on percent control and density counts, clopyralid appears to be the best treatment for controlling tansy ragwort in a grass pasture. It is however, not a registered treatment for pasture use. All the 2,4-D and dicamba treatments were also effective in controlling tansy ragwort and were not significantly different from each other or the clopyralid treatment. In addition they are presently registered for pasture use. The L.V. ester formulations of 2,4-D appear to be slightly more effective than the amine formulations, and tank mixing with dicamba does not appear to justify the increase in cost for the mix.

MCPB/MCPA and 2,4-DB, although recommended in some publications for tansy ragwort control was not effective in this trial, and displayed no signs of control. None of the treatments of which alfalfa was tolerant to, controlled tansy ragwort. Grass was injured initially by DPX 79406 and DPX 9674 but plots filled back in with wild and natural grasses. By the last assessment, no grass injury was observed in any of the plots.

The best registered treatments, based upon cost and efficacy would be 2,4-D L.V. ester and 2,4-D amine + dicamba. These treatments resulted in 96.3% and 95.0% respectively, and are one of the cheapest treatments. It was also found that a mowing of plots four weeks after treatment gave a better indication of control, since regrowth and recovery could be evaluated.

ACKNOWLEDGEMENTS: Appreciation is extended to Walter Tabor for providing the site for our trial and for his co-operation throughout the trial.

REFERENCES:

Thompson L.F., and P. Harris. 1986. Biological Control of Tansy Ragwort (_Senecio jacobaeae_ L.) Canadex Weed Control 641, Ag. Can., Ottawa

Table 1. Visual Evaluations and Tansy ragwort Densities

Treatment	Rate kg(a.i.) /ha	% CROP DAMAGE				% WEED CONTROL		TANSY RAGWORT COUNTS (12m^2)	
		Pasture		Alfalfa		Tansy Ragwort			
		0608	0820	0608	0820	0608	0820	Pre-Trt 0515	Post-Trt 0905
Control	-	0.0 f	0.0 NS	0.0 d	0.0 b	0.0 d	0.0 d	10 NS	19 ab
Dicamba	1.1	20.0 cd	0.0	93.8 a	97.5 a	33.8 c	87.5 ab	15	2 cd
2,4-D L.V ESTER	2.2	20.0 cd	0.0	72.5 ab	92.5 a	26.3 c	96.3 a	15	0 d
2.4-D L.V. ESTER + Dicamba	2.2 + 1.1	31.3 c	0.0	100 a	100 a	57.5 b	100 a	16	4 cd
2,4-DB Amine	1.7	5.0 ef	0.0	27.5 c	5.0 b	0.0 d	31.2 cd	13	19ab
MCPB/MCPA	1.7	5.7 ef	0.0	25.8 c	17.5 b	3.8 d	5.0 d	23	34 a
2,4-D Amine + Dicamba	.75 + .25	20.0 cd	0.0	88.8 ab	97.5 a	30.0 c	95.0 a	16	2 cd
DPX R9674 + Agral 90	0.03+0.2%v/v	57.5 b	0.0	60.0 b	0.0 b	66.3 ab	43.8 bc	15	5 bc
Clopyralid	0.25	8.8 de	0.0	81.3 ab	97.5 a	28.8 c	100 a	17	0 d
DPX 79406+ Agral 90	0.03+0.2%v/v	80.0 a	0.0	85.0 ab	5.0 b	73.3 a	5.0 d	18	41 a
2,4-D Amine	2.2	11.3 de	0.0	87.5 ab	100 a	25.0 c	88.8 a	17	2 cd

Means with the same letter are not significantly different at the 0.05 level of significance according to Duncan's multiple range test

BEDSTRAW CONTROL IN A TIMOTHY/ ALFALFA MIX

K.V. McCully, M.A. Mann, D.O. Hanscomb

ABSTRACT: A trial to evaluate various herbicides on their effectiveness in controlling smooth bedstraw (*Galium mollugo*) within a timothy & alfalfa mix was established. Visual ratings on weed control and crop damage were evaluated. Triclopyr (100%) resulted in the best bedstraw control followed by dicamba + mecoprop (80%). These treatments could be used within a grass crop only , as alfalfa was not tolerant to either of these treatments. Early bedstraw control was also observed from fluroxypyr treated plots.

RÉPRESSION DU GAILLET MOLLUGINE DANS UNE CULTURE MIXTE DE FLÉOLE ET DE LUZERNE

Résumé: Un essai a été réalise pour établir l'efficacité de divers herbicides contre le gaillet mollugine glabre (*Galium mollugo*) dans une culture mixte de fléole et de luzerne. On a fait une inspection visuelle du taux de répression de la mauvaise herbe et des dégâts causés aux cultures. Le triclopyr(100 p. 100) a été le plus efficace contre le gaillet mollugine dans la culture mixte, suivi par le dicamba + mécoprop (80 p. 100). Ces herbicides ne peuvent être utilisés que dans une culture de graminées, car la luzerne n'avait pas de tolérance contre eux. On a également observé qu'une application précoce de fluroxypyr était efficace contre le gaillet mollugine.

INTRODUCTION: Bedstraw has been increasing in densities and area steadily over the past few years. It is a perennial weed spreading by rhizomes and seeds. It was initially observed predominantly in ditches, but has since spread into abandoned fields low in fertility and now into a number of productive hay and alfalfa fields. It makes harvesting difficult and has little nutritional value.

Bedstraw is not as serious in fields tilled annually, but in fields planted to perennial crops such as hay and alfalfa, the problem is increasing. Presently there are no herbicides registered which will control bedstraw in these crops.

A trial was therefore established to evaluate various herbicides on bedstraw control in timothy. Some alfalfa was also present in these plots and reference will be made to its tolerance.

MATERIALS AND METHODS: The trial was established in an alfalfa/timothy mix in Cornhill, Sussex, King's County in a silt loam soil with a pH of 7.2 and an organic matter content of 5%. The crop was planted in 1985 at a seeding rate of 28 kg/ha. 115 kg/ha of K was applied. Experimental design was a randomized complete block with four replicates. Plot size was 2m*6m. Post emergence (Post) herbicides (see table 1) were applied May 15, 1990 when the alfalfa/timothy mix was 15-20 cm high and the smooth bedstraw was at the bud stage and approximately 20 cm high. Herbicides were applied using a CO_2 backpack sprayer in a water volume of 200 L/ha at a pressure of 200 kPa. Rainfall was 82 mm, 7 days prior application and 70 mm, 7 days after. Visual assessments on crop phytotoxicity and weed control were collected June 8, June 28, July 26, and August 20. First cut was taken June 28. Analysis of variance was performed on data. Arcsin transformations were performed on the visual evaluations where necessary and the means separated by Duncan's Multiple Range Test.

RESULTS AND DISCUSSION: By the first rating, June 8 (24 days after application), all treatments except clopyralid and mcpa/mecoprop/dicamba resulted in significant bedstraw control as compared to the untreated plots (see Table 1). The only treatments resulting in over 80% control at this time, however, were fluroxypyr (80.0%), dicamba + mecoprop (87.5%) and triclopyr (91.3%).

As the season progressed, and plots were harvested (June 28), bedstraw in all but the triclopyr and dicamba + mecoprop plots began to recover. By the final rating (Aug. 20) only the triclopyr (100.0%) and dicamba + mecoprop (80.0%) treatments resulted in acceptable control levels of over 80.0% (see table 1).

Although initial timothy injury was observed from a number of treatments (see table 1) most recovered following the June 28 harvest. The only treatments resulting in significant timothy damage as compared to the untreated control by August 20 were mcpa/mecoprop/dicamba (22.5%) and DPX 79406 (17.5%).

Alfalfa was also present in most plots and its tolerance to the various treatments was also assessed. By the first rating, June 8 (24 days after application) all treatments caused significant damage to the alfalfa (see table 1). Assessment of alfalfa regrowth following harvest indicated that injury was temporary from most treatments, but a reduction in alfalfa yield would have occured. By the final rating date (August 20), imazaethabenz and DPX R9674 fully recovered with no damage evident. DPX 79406, mecoprop and fluroxypyr although exhibiting some alfalfa damage, was not significantly higher than the untreated control plots.

CONCLUSIONS: Triclopyr and dicamba + mecoprop treatments resulted in the best bedstraw control. These treatments could be used within a grass crop. Alfalfa was not tolerant to any of the treatments which provided acceptable bedstraw control. Early control resulted from fluroxypyr and should also be further evaluated, particularly for control in alfalfa.

Acknowledgements: Appreciation is extended to Harley Marr, Corn Hill for providing the trial site and for his assistance and cooperation with the trial.

Table 1: Visual Evaluations - Crop Damage & Weed Control

Treatment	Rate kg(a.i.) /ha	% CROP DAMAGE Timothy 0608	Timothy 0628	Timothy 0820	Alfalfa 0608	Alfalfa 0628	Alfalfa 0820	% WEED CONTROL 0608	% WEED CONTROL 0820
Control	-	0 d	0 b	0 b	0 g	0 e	0 d	0 f	0 c
Mecoprop	1.1	8.8 c	0 b	5 b	85.0 b	63.7 c	12.5 cd	60 c	35.0 b
Triclopyr	1.75	7.5 c	0 b	0 b	86.3 b	71.2 bc	76.3 a	91.3 a	100 a
DPX 79406	0.03	66.3 a	57.5 a	17.5 a	70.0 cd	87.5 ab	5 d	57.5 c	12.0 bc
Clopyralid	0.3	0 d	0 b	0 b	90.0 b	100 a	77.5 a	1.3 f	0 c
DPX R9674	0.03	0 d	0 b	0 b	46.3 e	0 e	0 d	28.8 d	7.5 bc
2,4-D / mecoprop / dicamba	0.45	0 d	0 b	2.5 b	86.3 b	83.7 ab	40 bc	13.8 e	23.8 bc
mcpa/ mecoprop / dicamba	0.50	0 d	0 b	22.5 a	66.3 d	83.7 ab	46.3 b	5.0 f	38.8 b
Fluroxypyr	0.35	7.5 c	3.75 b	0 b	75.0 c	42.5 d	15 cd	80.0 b	32.5 b
Dicamba + Mecoprop	1.1 + 1.1	17.5 b	0 b	0 b	97.5 a	100 a	91.3 a	87.5 ab	80.0 a
Imazamethabenz + Agral 90	0.6 + .1% v/v	0 d	3.75 b	6.25 b	10.0 f	0 e	0 d	33.8 d	30.0 bc

Means with the same letter are not significantly different at the 0.05 level of significance according to Duncan's multiple range test

EVALUATION OF CLOPYRALID FOR SHEEP SORREL, DAISY AND VETCH CONTROL IN STRAWBERRIES

K.V.McCully, M.A.Mann, and D.O.Hanscomb

ABSTRACT: Three separate trials were established to evaluate the newly registered clopyralid for controlling 1) sheep sorrel 2) daisy and 3) vetch in strawberries. Treatments were fall applied in the sheep sorrel and vetch trial, and fall and spring applied in the daisy trial. Visual assessments on crop tolerance and weed control were taken and yield data collected where possible. Results from the sheep sorrel trial indicated that fall applied clopyralid at rates below 0.3 kg(a.i.)/ha should not be used for controlling sheep sorrel. Control can be expected up until picking time the following year. Daisy control was most effective from spring applied clopyralid at 0.4 and 0.3 kg(a.i.)/ha respectively. Vetch could be burned back at all the below labelled rates when fall applied, but regrowth can be expected the next year. Results indicated that the higher the rate, the higher the control . Crop tolerance in the three trials was excellent from all clopyralid rates and timings evaluated. No significant yield differences existed between treatments, where yield data was collected. Although not always significantly higher, clopyralid increased first picking yields slightly, as compared to the control.

ÉVALUATION DE L'EFFICACITÉ DU CLOPYRALIDE CONTRE LE RUMEX PETITE-OSEILLE, LA MARGUERITE ET LA VESCE SAUVAGE DANS LES FRAISERAIES

Résumé: Trois essais distincts ont été réalisés pour établir l'efficacité de l'herbicide clopyralide enregistré récemment pour la répression du (1) rumex petite-oseille, (2) de la marguerite, et (3) de la vesce sauvage dans les fraiseraies. Le clopyralide a été appliqué à l'automne pour l'essai du rumex petite-oseille et de la vesce sauvage, et une application a été faite à l'automne et au printemps pour l'essai de la marguerite. On a procédé à une évaluation visuelle de la tolérance de la culture et du taux de répression des mauvaises herbes, en plus de recueillir des données sur le rendement dans la mesure du possible. Les résultats de l'essai du rumex petite-oseille indiquent que l'application pendant l'automne de clopyramide à des taux inférieurs à 0,3 kg d'ingrédient actif par hectare n'est pas efficace contre cette mauvaise herbe. L'efficacité du produit à des taux supérieurs devrait se prolonger jusqu'à la période de cueillette l'année suivante. On a obtenu de bons résultats contre la marguerite avec une application printanière de clopyralide à raison de 0,4 et 0,3 kg d'ingrédient actif par hectare respectivement. La vesce sauvage a pu être réprimée avec une application automnale de 0,05, 0,15 et 0,20 kg d'ingrédient actif par hectare, mais on peut s'attendre à une repousse l'année suivante. Ces résultats ont indiqué que plus le taux d'application est élevé, plus grand est le taux de répression. La tolérance des fraisiers a été très bonne au cours des trois essais pour tous les taux d'application de clopyralide et à toutes les périodes d'application. Dans les cas où des données sur le rendement ont été recueillies, on n'a constaté aucun écart considérable de rendement entre les divers traitements. L'écart n'était pas toujours important, mais l'on a observé que le rendement de la première cueillette était un peu meilleur sur les fraisiers traités au clopyralide que sur les fraisiers témoins.

INTRODUCTION: Clopyralid (Lontrel^{tm}) produced by DowElanco recently received registration for use in strawberries. The registered rate is 0.2 to 0.3 kg(a.i.)/ha (1.0 to 1.5 L/ha product rate). It is known to be somewhat active on many weeds in the legume (i.e. vetch), composite (i.e. daisy) and buckwheat (i.e. sheep sorrel) families. The label states that vetch will be controlled and sheep sorrel and daisy will be suppressed.

Three trials were therefore established to evaluate the efficacy of clopyralid on sheep sorrel, daisy and vetch. The sheep sorrel trial included various clopyralid rates and other treatments applied in the fall. The daisy trial included various clopyralid rates applied in the fall and then compared to equivalent treatments applied in the spring. Vetch is known to be very sensitive to clopyralid and below labelled rates were therefore evaluated. This would give an indication of how low a rate vetch could be controlled at.

MATERIALS AND METHODS: Experimental design was a randomized complete block with four replicates. Herbicides were applied using a CO_2 backpack sprayer at a pressure of 200 kPa. Water volumes were 200 L/ha for the daisy control trial, 250 L/ha for vetch control trial and 300 L/ha for sheep sorrel control trial. Logarithmic transformations were performed on yield data and arcsin transformations were performed on visual observations where necessary. Means were separated by Duncan's multiple range test.

Sheep Sorrel Control Trial

The trial was established in Fredericton York County.'Glooscap' strawberries were planted May 26, 1986 in a sandy loam soil having a pH of 5.7 and an organic matter content of 3.4%. Row spacing was 1.52 m and plant spacing 0.41 m. 400 kg/ha of 10-20-20 fertilizer was applied in September of 1989. Plot size was 1.5 m x 2m. Clopyralid and dicamba treatments were applied October 12,1989 and propyzamide was applied November 17, 1989. Visual assessments on crop phytotoxicity and weed control were taken October 19, 1989, June 4, June 27 and July 27, 1990. Yields were taken July 6, July 9 and July 13. Rainfall levels seven days before first application was 7.2 mm and 15 mm, seven days after. Rainfall seven days before propyzamide application was 34 mm and 410 mm, seven days after.

Daisy Control Trial

The trial was established in Mactaquac, York County.'Kent' strawberries were planted in 1988 in a loam soil having a pH of 6.3 and an organic matter content of 4.6%. Row spacing was 1.52 m and plant spacing 0.50 m. Plot size was 1.5 m x 2m. 82.61 kg/ha of 12-24-24 fertilizer was applied. Herbicides (see Table 2) were applied October 31, 1989 and May 8, 1990. Renovation was July 29, 1990. Visual assessments on crop phytotoxicity and weed control were taken June 4, June 27 and August 23, 1990. Yields were taken July 3 and July 9. Rainfall was 9.6 mm seven days before fall application and 32 mm seven days after. Rainfall levels seven days before spring application was 12 mm and 50 mm, seven days after.

Vetch Control Trial

The trial was established in Jemseg, Queens County.'Kent' strawberries were planted in 1987 in a loam soil with a row spacing of 1.37 m and a plant spacing of 0.30 m. Plot size was 1.5 m x 4 m. Herbicides (see table 3) were applied October 12, 1989. Visual assessments on crop phytotoxicity and weed control were taken November 2, 1989, June 2, June 6 and July 17, 1990. Rainfall was 7.2 mm, seven days before application and 15 mm, seven days after.

RESULTS AND DISCUSSION:

CROP TOLERANCE: In all three trials no significant crop damage was observed at any assessment date from any clopyralid treatment. In the sheep sorrel trial dicamba resulted in 30.0% crop injury at the June 4 assessment date but recovered as the season progressed (see table 1). Damage was observed mostly on the first leaves and caused a narrow strapping. Yield data from the sheep sorrel trial indicated that yields were not significantly different from the control. Low yields resulted from clopyralid (0.2 kg(a.i.)/ha), but could be attributed to low initial plant densities and not crop injury. Analysis of yield data from the daisy trial indicated that although yields varied, there were no significant differences between treatments. Yields were not collected from the vetch trial, but rates tested were lower than the rates evaluated in the sheep sorrel and daisy trials. No yield differences would therefore be expected. First picking yields from clopyralid treatments were usually higher than the control, but not significantly.

WEED CONTROL

1. Sheep Sorrel Control Trial

All treatments resulted in significant sheep sorrel control by the June 4 assessment date (see table 1). Control levels ranged between 43.8% and 82.5% by the June 4 assessment date (see Table 1). The best treatment at this time was dicamba (82.5%), followed by clopyralid 0.4, 0.3 and 0.2 kg(a.i.)/ha (78.8%, 72.5%, 62.5%) respectively. These treatments were not significantly different from one another, however.

By June 27 only clopyralid (0.4 kg(a.i.)/ha) (67.5%), dicamba (65.0%), and clopyralid (0.3 kg(a.i.)/ha) (47.5%) resulted in significantly higher control than the untreated plots. These treatments were also significantly higher than the control at the July 27 assessment date, but at slightly reduced control levels (see Table 1).Propyzamide was the poorest treatment tested.

2. Daisy Control Trial

By the June 4 assessment date, all treatments whether applied in the spring or fall, resulted in significant daisy control as compared to the untreated plots. Control levels ranged from 39.0% to 85.0% with spring applied clopyralid (0.3 and 0.4 kg(a.i.)/ha) rates resulting in the highest control levels (85.0 and 83.0%) (see Table

2). These two treatments were significantly higher than all other treatments. Fall applied treatments were not significantly different from one another, but the higher the rate, the higher the control.

On June 27 all treatments continued to provide significant daisy control as compared to the untreated plots. Control levels ranged from 27.5% to 77.5% (see Table 2), with the spring applied clopyralid applied at 0.3 and 0.4 kg(a.i.)/ha still providing the highest control levels. The next best treatments were the equivalent rates applied in the fall.

By August 23 all treatments continued to provide significant daisy control as compared to the untreated plots. Control was less pronounced at this time and ranged from 19.0% to 58.0%. Spring applied clopyralid at 0.3 and 0.4 kg(a.i.)/ha contined to provide the highest control levels with 56.0% and 58.0% control respectively. The remaining treatments although significantly higher than the control, were not significantly different from one another.

Overall, the two highest clopyralid rates (0.3 and 0.4 kg(a.i.)/ha) applied in the spring, resulted in the highest levels of daisy control. Daisy control was less from the fall applications at equivalent rates.

3. Vetch Control Trial

Twenty-one days after clopyralid application (November 2) all treatments resulted in significant vetch control as compared to the untreated plots. Control levels ranged from 50.0 to 82.5% with the highest rates providing the highest control levels. Treatments providing over 70.0% control and not significantly different from one another included clopyralid 0.1, 0.05, 0.04 and 0.075 kg(a.i.)/ha providing 82.5%, 72.5%, 70.0% and 70.0% control respectively (see Table 3).

The following spring plots were assessed to evaluate regrowth. Results indicated that vetch was still being controlled but at reduced levels. At the June 19 assessment date all treatments continued to provide significant vetch control as compared to the untreated plots. Control levels ranged from 30.0% to 62.5% with clopyralid applied at 0.1, 0.05 and 0.075 kg(a.i.)/ha providing the highest control levels (62.5%, 52.5% and 50.0%) respectively. At the July 17 assessment date results indicated that vetch was continuing to recover. Although providing significantly higher control than the untreated plots, control levels were too low and unacceptable. Control levels ranged from 6.3 to 38.8%, with the highest rates providing the highest control levels. At the rates tested, vetch was controlled satisfactorily up until June 19. After this time vetch recovered rapidly.

CONCLUSIONS: Crop tolerance was excellent from all clopyralid rates tested. Although yields varied where collected,they were not significantly different from the control. The small plot size (1.5m x 2.0m) may have attributed to the no significant differences between treatments. First picking yields were usually higher from clopyralid treated plots, but not significantly higher than the control.

Clopyralid, fall applied at 0.3 and 0.4 kg(a.i.)/ha controlled sheep sorrel over 70.0% up until June 4 the following year. As the summer progressed the sheep sorrel recovered somewhat, reducing control levels to 43.8% and 65.0% respectively. The higher rate does not provide enough extra control to justify its use. Sheep sorrel control can therefore be expected up until approximately picking time, but rates below 0.3 kg(a.i.)/ha should not be used. Dicamba also provided good sheep sorrel control but resulted in initial crop damage.

Daisy control was most effective from spring applied clopyralid at 0.3 and 0.4 kg(a.i.)/ha as compared to fall applications at equivalent rates. As the summer progressed however, daisies recovered somewhat. Spring applications and rates above 0.3 kg(a.i.)/ha are not registered.

Clopyralid applied in the fall controlled vetch early into the next season. By June 19th vetch control ranged from 30.0 to 62.5%, but was reduced as the season progressed. The highest rates provided the highest levels of control throughout the rating periods. Results indicated that below labelled rates applied in the fall can reduce vetch populations, but regrowth can be expected later the following year. It may still be cheaper in the long run however to apply a series of low rates as needed rather than a few high rates. The lower rates appear to be burning back the vetch. Higher rates may be needed to ensure that enough product translocates to kill the rhizome buds.

ACKNOWLEDGEMENTS: Appreciation is extended to Dave Walker, Alan Daoust and James Love for providing trial sites and for their assistance with the trials.

Table 1: Sheep Sorrel Control Trial- Visual Evaluations and Yields

TREATMENT	RATE Kg(a.i.) /ha	CROP DAMAGE 06 04 90	CROP DAMAGE 07 27 90	SHEEP SORREL CONTROL 06 04 90	SHEEP SORREL CONTROL 06 27 90	SHEEP SORREL CONTROL 07 27 90	TOTAL YIELD g/m^2
Control	-	0.0b	0.0	0.0c	0.0c	0.0c	1150ab
Clopyralid	0.2	5.0b	0.0	62.5ab	10.0bc	12.5bc	870b
Clopyralid	0.3	0.0b	0.0	72.5a	47.5ab	43.8ab	1500a
Clopyralid	0.4	0.0b	0.0	78.8a	67.5a	65.0a	1410a
Dicamba	0.42	30.0a	0.0	82.5a	65.0a	60.0a	1180ab
Propyzamide	1.1	0.0b	0.0	43.8b	25.0abc	23.8abc	1380a

Table II: Daisy Control Trial- Visual Evaluations and Yields

TREATMENT	TIMING	RATE Kg(a.i.) /ha	OX-EYE DAISY CONTROL 06 04 90	OX-EYE DAISY CONTROL 06 27 90	OX-EYE DAISY CONTROL 08 23 90	YIELD g/m^2
Control	-	-	0.0c	0.0d	0.0c	239
Clopyralid	Fall	0.2	39.0b	27.5c	19.0b	345
Clopyralid	Fall	0.3	53.0b	46.3b	30.0b	307
Clopyralid	Fall	0.4	55.0b	48.8b	33.0b	304
Clopyralid	Spring	0.2	41.0b	36.3bc	25.0b	361
Clopyralid	Spring	0.3	85.0a	76.3a	56.0a	270
Clopyralid	Spring	0.4	83.0a	77.5a	58.0a	365

Means with the same letter are not significantly different at the 0.05 level of significance according to Duncan's multiple range test

Table III: Vetch Control Trial-Visual Evaluations

TREATMENT	RATE kg(a.i.)/ha	Crop Damage 11 02 89	Tufted Vetch 11 02 89	Tufted Vetch Control 06 19 90	Tufted Vetch Control 07 17 90
Control	-	0.0	0.0e	0.0e	0.0e
Clopyralid	0.01	0.0	50.0d	30.0d	6.3d
Clopyralid	0.02	0.0	53.8cd	33.8cd	17.5bc
Clopyralid	0.03	0.0	63.8bcd	42.5bcd	15.0cd
Clopyralid	0.04	0.0	70.0abc	48.8abc	35.0ab
Clopyralid	0.05	0.0	72.5ab	52.5ab	22.5abc
Clopyralid	0.075	0.0	70.0abc	50.0abc	26.3abc
Clopyralid	0.1	0.0	82.5a	62.5a	38.8a

means with the same letter are not significantly different at the 0.05 level of significance according to Duncan's multiple range test.

REDUCED RATES OF CLOPYRALID FOR VETCH CONTROL IN APPLE ORCHARDS

K.V. McCully, M.A. Mann, and D.O. Hanscomb

ABSTRACT: A trial to evaluate vetch control and crop tolerance at reduced clopyralid rates in a MacIntosh apple orchard was established. Visual assessments on crop injury and vetch control were collected. Results indicated that vetch was significantly controlled at rates as low as 0.05 kg(a.i.)/ha (72.5%). Although this rate provided less control than the 0.15 (98.8%) and 0.20 kg(a.i.)/ha (98.8%) rates, it was not significantly lower. Further evaluations must be collected next year to determine the amount of vetch regrowth from the lower rates.

APPLICATION RÉDUITE DE CLOPYRALIDE POUR LA RÉPRESSION DE LA VESCE SAUVAGE DANS LES VERGERS

Résumé: Un essai a éte réalise pour établir l'efficacité d'application réduites de clopyralide contre la vesce sauvage et la tolérance des pommiers de variéte MacIntosh. On a fait une évaluation visuelle des dommages causés à la culture et du taux de répression de la vesce sauvage. Les résultats indiquent que l'on parvient à réprimer considérablement la vesce sauvage (dans une proportion de 72,5 p. 100) avec un taux d'application aussi bas que 0,05 kg d'ingrédient actif par hectare. Ce taux d'application ne donne pas d'aussi bons résultats qu'un taux de 0,15 et 0,20 kg d'ingrédient actif par hectare (98,8 p. 100), mais il n'est pas inférieur de beaucoup. Il faudra procéder à d'autres évaluations l'année prochaine pour déterminer la quantité de repousse correspondant aux taux d'application les plus bas.

INTRODUCTION: One of the most common weeds associated with apple orchards is vetch. Currently there are no products registered that provides long term control at acceptable levels. A new product currently being evaluated in orchards is clopyralid (Lontrel^{tm}), produced by DowElanco. Rates registered in other crops are 0.2 to 0.3 kg(a.i.)/ha (1.0 to 1.5 L/ha). Vetch is very sensitive to this product and it is of great interest to determine how low a rate growers could apply this product and still get results. Tree tolerance must also be assessed. A trial was therefore established to evaluate tree tolerance and vetch control, and generate data that may help in the registration process. Rates evaluated were between 0.05 and 0.20 kg(a.i.)/ha.

MATERIALS AND METHODS: A trial was established at Jemseg, Queens county in a MacIntosh apple orchard. Experimental design was a randomized complete block with four replicates. Plot size was 4m x 4m and included one tree per plot. Clopyralid was applied post emergence (POST) July 5, 1990, to mature vetch at the bud stage. Herbicides (see Table 1) were applied using a CO_2 backpack sprayer in a water volume of 200 L/ha. Sprayer pressure was 200 kPa. Rainfall was 13.6 mm seven days before application and 1.0 mm fourteen days after. Percent vetch ground cover prior to spray was taken July 5. Visual assessments on vetch control were taken July 17 and August 20. Means were separated by Duncan's multiple range test.

RESULTS AND DISCUSSION: No observable crop injury resulted from any of the clopyralid treatments at any assessment date. Vetch percent cover of plots at application time indicated a uniform stand between plots, as no significant difference existed between treatments (see Table 1).

By the first assessment date, 12 days after application (July 17) all treatments significantly controlled vetch as compared to the untreated control (see Table 1). Control levels ranged from 36.3% to 73.2%. The top three treatments included clopyralid 0.2, 0.15 and 0.05 kg(a.i.)/ha, providing 73.2%, 63.8% and 48.8% control respectively. Although varying they were not significantly different from one another. As the summer progressed vetch control further increased. By August 20 (46 days after application) control levels ranged from 48.8% to 98.8% (see Table 1). The top three treatments remained the same with clopyralid applied at 0.20 and 0.15 kg(a.i.)/ha resulting in 98.8% vetch control followed by clopyralid at 0.05 kg(a.i.)/ha with 72.5% control. Reasons for the 0.05 rate resulting in higher vetch control than the 0.10 kg(a.i.)/ha rate is not understood and is unexplainable. Initial vetch percent cover ratings for these two rates were equivalent.

CONCLUSIONS: Crop tolerance was excellent from clopyralid rates evaluated. It was determined that clopyralid at all rates tested resulted in significantly higher vetch control than the untreated plots at both assessment dates. Vetch can be controlled at rates lower than the 0.20 kg(a.i.)/ha rate. The lowest rate of 0.05 kg(a.i.)/ha, although providing less vetch control than the 0.20 and 0.15 rates, was not significantly lower. Reasons for the 0.05 rate being more effective than the 0.10 kg(a.i.)/ha rate is not understood. Before final conclusions can be made, plots will have to be evaluated for regrowth next year. Although these lower rates may have burnt back the vetch this year, it is possible that regrowth will be high in these plots next year .

ACKNOWLEDGEMENTS: Appreciation is extended to Alan Daoust for providing the trial site and for his assistance with the trial.

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Table 1: **CROP DAMAGE AND VETCH CONTROL RATINGS.**

Treatment	Rate kg(a.i.)/ha	Crop Damage August 20	% Vetch Cover BEFORE SPRAYING (July 5)	Vetch Control	
				July 17	August 20
Clopyralid	0.05	0	41.3 n.s.	48.8 ab	72.5 ab
Clopyralid	0.10	0	41.3	36.3 b	48.8 b
Clopyralid	0.15	0	38.8	63.8 ab	98.8 a
Clopyralid	0.20	0	45.0	73.2 a	98.8 a
Control	-	0	28.8	0.0 c	0.0 c

Means followed by the same letter are not significantly different at the 0.05 level of significance according to the Duncan's multiple range test.

EVALUATION OF DICAMBA FORMULATIONS AND TANK MIXES IN WINTER WHEAT

K.V. McCully, M.A. Mann, D.O. Hanscomb

ABSTRACT: A trial to evaluate various dicamba formulations, rates and tank mixes on Lennox winter wheat was conducted at Mactaquac, York County. Crop tolerance and weed control was visually evaluated. Crop height measurements and yields were also collected. Winter wheat was very tolerant to all dicamba rates, formulations and tank mixes. No significant differences between treatments were observed when evaluating crop damage, crop height, or yields. There were not significant differences in weed control between dicamba solution (SM) and dicamba wettable granules (WG) at either the 0.11 or 0.14 kg (a.i.)/ha rate whether applied alone or tank mixed with 2,4-D or MCPA. Tank mixes were compatible and more effective than dicamba applied alone, and dicamba + MCPA tank mixes were more effective than dicamba + 2,4-D treatments, although both were not always significantly different.

APPLICATION DE COMPOSÉS ET DE MÉLANGES DE DICAMBA SUR LE BLÉ D'HIVER

Résumé: Un essai a eu lieu à Mactaquac, comté de York, pour évaluer divers taux, composés et mélanges de dicamba sur le blé d'hiver Lennox. On a évalué visuellement la tolérance de la culture et le taux de répression des mauvaises herbes, en plus de mesurer la hauteur de la culture et les rendements obtenus. Le blé d'hiver était très tolérant à tous les taux, composés et mélanges de dicamba. On n'a pas observé d'écart considérable entre les traitements après avoir évalué les dégâts causés à la culture, la hauteur de la culture et les rendements. On n'a pas relevé non plus d'écart important dans la répression des mauvaises herbes lorsqu'on a appliqué une solution de dicamba et des granules mouillables de dicamba aux taux de 0,11 ou de 0,14 kg d'ingrédient actif par hectare, qu'ils aient été appliqués seuls ou mélangés avec du 2,4-D ou du MCPA le 29 juin 1990. L'efficacité du produit n'était pas toujours beaucoup plus grande, mais les mélanges étaient compatibles et plus efficaces que le dicamba appliqué seul. Les mélanges de dicamba + MCPA ont été plus efficaces que les traitements de dicamba + 2,4-D, mais pas toujours de beaucoup.

INTRODUCTION:

The winter wheat acreage in New Brunswick has slowly been increasing with the introduction of new hardier cultivars. One herbicide currently registered and recommended is dicamba, applied either alone or in a tank mix with 2,4-D or MCPA Amine. A preformulated mix of dicamba/MCPA is also available and sold as Dyvel (TM).

Recently many chemical companies have been changing their herbicide formulations. One such example is with dicamba. Currently only the dicamba DMA solution (SN) is registered but the company is interested in registering its wettable granule (WG) formulation. The wettable granules are easier to handle, are more user friendly and helps reduce container disposal problems.

A trial was therefore established to compare the dicamba WG formulation with the SN formulation at 2 different rates and in various tank mixes. the objectives of this trial were to assess the relative crop injury potential and weed control effectiveness of the dicamba formulations with phenoxy herbicides.

MATERIALS & METHODS

The trial was established in Mactaquac, York County in a silt loam soil having a pH of 6.2. 'Lennox' winter wheat was planted September 11, 1989 at a 15 cm row spacing. 22 kg/ha of 12-24-24 fertilizer was applied. Experimental design was a randomized complete block with four replicates. Plot size was 2m x 8.5m. (See

Table 1). Previous crop was summer fallow. Post-emergence (Post) herbicides were applied May 8, 1990 at the winter wheat 2-3 leaf stage. Herbicides were applied using a CO_2 backpack sprayer in a water volume of 200 L/ha at 200 kPa of pressure. Rainfall was 12mm seven days prior to application and 50mm seven days after. Visual evaluations on crop phytotoxicity and weed control were collected May 24, June 4, June 29 and July 30. Crop height was measured May 24, June 4 and June 29. Harvest was August 7th. Arcsin transformations were performed, when necessary, on visual evaluations and logarithmic transformations were performed on the heights and yields. Mean's were separated according to Duncan's multiple range test.

Crop Damage

No significant crop damage was observed from any of the treatments, throughout the rating period. Winter wheat height measurements collected at three different dates also revealed no significant height differences between treatments. Although the untreated control had the lowest yields, there were no significant differences between treatments. Winter wheat was therefore very tolerant to all the different dicamba rates, formulations and mixes.

Weed Control

Major weeds present in plots included sheep sorrel, hempnettle, daisy, vetch and quackgrass. By the first rating date (16 days after application), all treatments significantly controlled weeds as compared to the untreated control (See Table 1). The dicamba solution (SN) treatments .11 and .14 kg(a.i.)/ha resulted in significantly better weed control than the dicamba WG (wettable granules) formulations at the same rates. As the season progressed there were no significant differences between the two formulations applied at the same active rates. The higher rates generally resulted in higher levels of weed control but not always significantly.

There were no significant differences between the dicamba solutions (SN) and wettable granule (WG) when mixed with 2,4-D Amine at the 0.11 or 0.14 kg(a.i.)/ha dicamba rates throughout the rating periods. There were also no significant differences between any of the dicamba + 2,4-D treatments irregardless of the rate or formulation except during the June 29 assessment date. At this time the dicamba (WG) + 2,4-D (0.14 + 0.43 kg(.ai.)/ha) Reasons for this are not understood.

There were no significant differences between formulations or rates of dicamba when mixed with MCPA Amine during any of the assessment dates. The addition of MCPA to dicamba also improved weed control as compared to dicamba alone or 2,4-D added. The improvement was not always significant however.

The dicamba/MCPS-K preformulated solution (SM) mix consistently resulted in higher levels of weed control than the dicamba/MCPA-NA preformulated soluble granule (SG) mix. Differences were however not significant. During the first assessment date only the dicamba/MCPA-NA treatment was slightly less effective than the tank mixed dicamba + MCPA, and not always significantly less (see Table 1). As the season progressed there were no significant differences between the dicamba/MCPA salt preformulated tank mixes and the dicamba + MCPA Amine tank mixes.

CONCLUSIONS:

Winter wheat was very tolerant to all dicamba rates, formulations and tank mixes evaluated. There were no significant damage, height reductions or yield differences between any of the treatments. As the season progressed there were no significant differences in weed control between the dicamba solution (SN) and dicamba wettable granule (WG) at either the 0.11 or the 0.14 kg(a.i.)/ha rates whether applied alone or in a tank mix with 2,4-D o MCPA. The tank mixes were generally more effective than dicamba applied alone, but not always significantly and the dicamba + MCPA tank mixes were usually better than the dicamba + 2,4-D tank mix but not always significant.

Overall, it was determined that the crop injury potential and weed control effectiveness were generally the same for both the dicamba solution (SN) and the dicamba Wettable granule (WG) at both rates evaluated. It was also determined that the phenoxy herbicides were compatible with both dicamba formulations at both rates.s

ACKNOWLEDGEMENTS:

Appreciation is extended to James Love for providing the trial site and for his assistance and cooperation with the trial.

Table 1: Visual Evaluations, Barley Height Measurements and Yields

TREATMENT	RATE (kg(a.i.) /ha	Formulation & % Concentration	% Crop Damage 0524	Winter Wheat Height cm 0524	Height cm 0604	% Weed Control			Yields G/M^2 0807
						0524	0604	0629	
Control	-	-	0.0 ns	25.5 ns	52.0 ns	0.00 f	0.00 f	0 f	215 ns
Dicamba	0.11	48.0 Sn	0.0	25.0	53.5	37.5 d	35.0 de	17.5 de	314
Dicamba	0.11	70.0 Wg	0.0	24.2	51.5	22.5e	21.3e	8.8 ef	249
Dicamba	0.14	48.0 Sn	0.0	24.3	48.3	58.2 c	48.8 bcd	31.3 bcd	241
Dicamba	0.14	70.0 Wg	0.0	24.0	51.0	46.3 d	33.8 de	28.8 bcd	274
Dicamba + 2,4-D Amine	0.11 + 0.43	48 sn + 50 Sn	0.0	24.0	47.8	62.5 bc	52.5 abcd	55 abc	249
Dicamba + 2,4-D Amine	0.11 + 0.43	70 Wg + 50 Sn	0.0	24.5	50.3	68.2 abc	53.8 abcd	61.3 a	285
Dicamba + 2,4-D Amine	0.14 + 0.43	48 Sn + 50 Sn	0.0	24.0	49.0	67.5abc	63.8 abcd	57.5 ab	234
Dicamba + 2,4-D Amine	0.14 + 0.43	70 Wg + 50 Sn	0.0	23.8	48.8	66.3 abc	37.5 cde	30 bcd	241
Dicamba + MCPA Amine	0.11 + 0.43	48 Sn + 50 Sn	0.0	24.0	48.0	68.2abc	61.3abcd	41.3 abc	247
Dicamba + MCPA Amine	0.11 + 0.43	70 Wg + 50 Sn	0.0	23.3	49.0	76.3a	79.5a	57.5 ab	252
Dicamba + MCPA Amine	0.14 + 0.43	48 Sn + 50 Sn	0.0	23.8	49.0	77.0a	68.8ab	60 a	270
Dicamba + MCPA Amine	0.14 + 0.43	70 Wg + 50 Sn	0.0	23.3	50.0	73.2ab	67.0abc	42.5 abc	232
Dicamba/MCPA-K*	0.11/0.43	8.4/33.6 Sn	0.0	24.3	46.5	68.8abc	70.0ab	43.8 abc	287
Dicamba/MCPA-Na*	0.11/0.43	70 Sg	0.0	24.8	51.3	57.5c	60.0abcd	42.5 abc	279

Sn=solution; Sg=soluable granular; Wg=wettable granular

*preformulated mix

means with the same letter are not significantly different at the 0.05 level of significance according to Duncan's multiple range test.

ALTERNATIVES TO DINOSEB FOR WEED CONTROL IN SNAP BEANS

K. McCully, M. Mann, and D. Hanscomb

ABSTRACT: A trial to evaluate various herbicides as alternatives to dinoseb was established. Preplant incorporated, preemergence, and post emergence herbicides applied either alone, in a tank mix or applied sequentially were evaluated. Visual ratings on crop damage and individual weed species control were collected. In addition yields and crop maturity ratings were collected and evaluated. Results indicated that initial damage was observed from a number of treatments, but as the season progressed damage levels were not significantly different from the control. Yields were not always the highest from the plots having the best weed control. Promising treatments based upon yields included eptc, metobromuron, clomazone + ethalfluralin, bentazon + assist, and monolinuron. Treatments resulting in long term overall weed control included monolinuron, eptc + monolinuron; trifluralin + metobromuron, trifluralin + bentazon + assist, and clomazone + ethalfluralin + metobromuron.

SUBSTITUTS DU DINOSÈBE POUR RÉPRIMER LES MAUVAISES HERBES DANS LES CULTURES DE HARICOT MANGE-TOUT

Résumé: Un essai a eu lieu pour évaluer l'aptitude de divers herbicides à remplacer le dinosèbe. On a évalué des herbicides incorporés au sol avant la plantation et des herbicides de prélevée et de postlevée; ils ont été appliqués seuls, dans un mélange ou en application séquentielle. On a fait l'évaluation visuelle des dommages causés aux haricots mange-tout et noté les espèces de mauvaises herbes détruites, en plus de recueillir et d'analyser des données sur le rendement et sur la maturation de la culture. Les résultats indiquent que certains traitements ont causé des dommages aux plantes, mais que le taux de dommage n'était pas beaucoup plus grand sur les haricots traités que sur les haricots non traités à mesure que la saison progressait. Les rendements n'ont pas toujours été les plus élevés dans les parcelles où la répression des mauvaises herbes était la meilleure. Les traitements les plus prometteurs en fonction du rendement sont les suivants: EPTC, métobromuron, clomazone + éthalfluraline, bentazon + assist et monolinuron. Les traitements qui ont produit une répression durable des mauvaises herbes en général sont les suivants: monolinuron, EPTC + monolinuron, trifluraline + métobromuron, trifluraline + bentazon + assist, et clomazone + éthalfluraline + métobromuron.

INTRODUCTION: Currently there are approximately 300 acres of processing beans grown in New Brunswick as well as a number of acres for the fresh market. The most commonly used and most effective herbicide used over the years has been dinoseb. However, as of November 1, 1990 no further use of dinoseb will be permitted in N.B. as a result of its being banned by the N.B. Department of Environment.

In beans grown for processing, weed free fields are essential. Fields heavily contaminated with weeds may even be by-passed. The banning of dinoseb is of an acute concern to bean growers, and since lost, an alternative herbicide must be found. A trial was therefore initiated to evaluate various pre-plant incorporated (ppi), pre-emergent (pre) and post emergent (post) herbicides applied either alone or in a tank mix for weed control and crop tolerance in snap beans.

MATERIALS AND METHODS: Gold Rush beans were planted June 6, 1990 in a trial at Florenceville, Carleton County. The soil type was a loam having a pH of 6.7 and an organic matter content of 3.0%. The seeding rate was 48 kg/ha and in row spacing was 76 cm. 392 kg/ha of 8-16-12 fertilizer was applied. Experimental design was a randomized complete block with four replicates. Plot size was 2m x 6m. Previous crop was potatoes. Preplant incorporated (PPI) herbicides (See Table I) were applied June 6 and incorporated with a roto-tiller to a depth of 7.5 cm. Preemergence herbicides (see Table 1) were applied June 7. Post-emergence (Post) herbicides (see Table I) were applied July 12 at the 2-3 trifoliate bean leaf stage and when weeds were approximately 2.5 cm high. Herbicides were applied using a CO_2 backpack sprayer in a water volume of 200 L/ha. Sprayer pressure was 200 kPa. Rainfall levels were 12mm, seven days before the PPI applications and 14 mm, seven days after. Rainfall levels seven days before PRE applications were 4.2 mm and 14 mm, seven days after. Rainfall levels seven days before POST applications were 9.8 mm and 1.2 mm, seven days after.

Visual assessments on crop phytotoxicity and individual weed species control were taken July 12 and August 3. Harvest was August 13 and bean maturity was evaluated at this time (Bean maturity involved measuring ten centre seeds from size 4 beans in millimetres). Analysis of variance was performed on data. Arcsin transformations were performed on the visual ratings where necessary. Yield and maturity data were transformed using logs. Means were separated by Duncan's Multiple Range Test.

RESULTS AND DISCUSSION:

CROP TOLERANCE: Initial significant crop injury was observed from only treatments containing clomazone. Clomazone injury was in the form of a white bleaching. By the last assessment date (Aug. 3) all beans had recovered to levels not significantly different from the untreated control (See Table 1).

The untreated control resulted in the lowest yields as expected. Eleven treatments resulted in significantly higher yields than the control. Top yielding treatments included eptc (14.7 t/ha); metobromuron (14.4); clomazone + ethalfluralin (14.2); bentazon + assist (14.2) and dinoseb (14.1). The only treatments resulting in significantly lower yields than dinoseb was BAS 35140 and the untreated control. Bean maturity varied between treatments with no apparent relationship between crop injury and yields.

WEED CONTROL: Weed pressure was relatively low in plots, making evaluation more difficult. Six weeds which were relatively consistent from plot to plot were barnyard grass, lamb's quarters, lady's thumb, wild buckwheat, shepherd's purse and pineapple weed.

Barnyard grass was significantly controlled as compared to the untreated control plots by all treatments except fomesafen + bentazon, BAS 35140, fomesafen + Agral 90 and bentazon + Assist, (See Table 1). This was expected as these herbicides are known to be weak on grasses. All treatments , except the above mentioned and imazethapyr, were significantly better than the dinoseb treatment. The remaining treatments control levels ranged from 75 to 100% and were not significantly different from each other.

Lamb's quarters was significantly controlled as compared to the untreated plots and dinoseb by all treatments except fomesafen + agral 90 (See Table 1). Although many treatments had higher control levels than dinoseb, none were significantly higher, indicating variability between plots.

Lady's thumb was significantly controlled as compared to the untreated plots by all treatments except eptc + metobromuron and BAS 35140. Better control was expected with these treatments and reasons for their poor control is not understood. Although control levels varied from treatment to treatment, none were significantly different from the dinoseb treatment.

Wild buckwheat was significantly controlled as compared to the untreated plots by all treatments except eptc, eptc + metobromuron and dinoseb (See Table 1). Treatments providing significantly higher control than dinoseb included ethalfluralin, trifluralin, clomazone + ethalfluralin, clomazone + ethalfluralin + metobromuron, trifluralin + bentazon + assist, monolinuron, trifluralin + monolinuron, eptc + monolinuron, imazethapyr, clomazone and fomesafen + agral 90.

Shepherd's purse was significantly controlled as compared to the untreated plots by all treatments except trifluralin, eptc + metobromuron, eptc, ethalfluralin, imazethapyr and dinoseb (See Table 1). The remainding treatments with the exception of BAS 35140 and fomesafen + Agral 90 all resulted in control significantly higher than that obtained from dinoseb.

Pineapple weed was significantly controlled as compared to the untreated plots by all treatments except trifluralin and eptc. The remaining treatments were not significantly different from the dinoseb treatment.

Most of the treatments tested were as good as, or better than dinoseb for weed control in beans. Treatments resulting in overall weed control poorer than that obtained from dinoseb included trifluralin, eptc + metobromuron, fomesafen + Agral 90, Bas 35140, and eptc.

Although poorer overall, weed control on an individual weed species basis were not always significantly lower than control obtained from dinoseb.

Treatments resulting in the best overall weed control, and could be considered as possible alternatives to dinoseb in terms of weed control included: monolinuron; eptc + monolinuron; trifluralin + metobromuron; clomazone + ethalfluralin + metobromuron; trifluralin + bentazon + assist; trifluralin + monolinuron, clomazone; and clomazone + ethalfluralin. Depending upon the weed problem, one of the above herbicides could be chosen. The only product not registered from the above treatments is clomazone.

CONCLUSIONS: Initial crop damage was observed from clomazone treatments, but by harvest all treated plots had recovered to levels not significantly different from the untreated control.

Treatments resulting in the best weed control by the last assessment date did not necessarily have the highest yields. This could be expected since weed control is most important during the first few weeks of bean emergence rather than late season control. Therefore, although weed control may have been less in some plots by the last assessment date, there may have been enough weed control earlier in the season, when it was most critical.

Based upon yields, more work should be conducted with eptc, metobromuron, clomazone, ethalfluralin, bentazon + assist and monolinuron as alternatives to dinoseb. In a trial conducted last year (McCully et al.), eptc, monolinuron and metobromuron were amongst the highest yielding treatments, indicating some consistency and promise for dinoseb alternatives from year to year.

ACKNOWLEDGEMENTS: Appreciation is extended to McCains employees who assisted with the trial.

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Table 1- Crop Damage, Weed Control, Bean Maturities and Yields

Treatment	Rate kg(a.i.) /ha	% CROP DAMAGE (0712)	(0803)	% WEED CONTROL (0803) BYG	LQ	LT	WB	SHP	PWW	BEAN MATURITY (0813)	YLD t/ha (0813)
Control	-	0.0 c	0.0 NS	0.0 d	0.0 c	25.0 b	0.0 c	0.0 d	0.0 c	105 abc	10.1 d
Trifluralin	1.1	5.0 c	1.3	75.0 ab	72.5 ab	75.0 a	75.0 ab	0.0 d	25.0 bc	107 abc	12.4a-d
EPTC	3.9	0.0 c	0.0	100 a	65.0 ab	90.0 a	25.0 bc	25.0 cd	25.0 bc	105 abc	14.7 a
Ethalfluralin	0.85	0.0 c	0.0	100 a	75.0 ab	100 a	100 a	25.0 cd	50.0 ab	105 abc	12.9 abc
Metobromuron	1.2	0.0 c	0.0	82.5a	100a	75.0 a	62.5 ab	92.5 ab	100 a	107 abc	14.4 ab
Trifluralin + Metobromuron	1.1 + 1.2	5.0 c	5.0	100 a	100 a	100 a	100 a	100 a	100 a	92 d	13.2 abc
Clomazone	0.75	65.0 a	1.3	100 a	100 a	90.0 a	97.5 a	93.8 ab	100 a	108 abc	12.0 a-d
Clomazone + Ethalfluralin	0.5 + .85	35.0 b	1.3	100 a	100 a	100 a	100 a	100 a	75.0 a	106 abc	14.2 ab
Clomazone + Ethalfluralin + Metobromuron	0.5 + 0.85 + 1.0	32.5 b	1.3	95.0 a	100 a	100 a	100 a	100 a	100 a	97 cd	13.8 ab
Bentazon + Assist	1.0 + 2.0	0.0 c	5.0	27.5 cd	78.8 ab	100 a	75.0 ab	100 a	100 a	111 ab	14.2 ab
Trifluralin + Bentazon + Assist	1.1 + 1.0+2.0	0.0 c	6.3	100 a	93.8 a	100 a	100 a	100 a	100 a	105 abc	12.9 a-d
BAS 35140	1.08	0.0 c	1.3	0.0 d	45.0 b	50.0 ab	50.0 ab	67.5 abc	100 a	113 a	10.7 cd
Monolinuron	1.25	0.0 c	0.0	100 a	100 a	100 a	100 a	100 a	100 a	110 abc	13.9 ab
Trifluralin + Monolinuron	1.1 + 1.25	5.0 c	2.5	100 a	100 a	92.5 a	100 a	100 a	100 a	106 abc	12.2a-d
EPTC + Metobromuron	3.9 + 1.2	0.0 c	1.3	100 a	67.5 ab	50.0 ab	25.0 bc	0.0 d	50.0 ab	102 abcd	13.5abc
EPTC + Monolinuron	3.9 + 1.25	5.0 c	6.3	100 a	100 a	100 a	100 a	100 a	100 a	100 bcd	12.7a-d
Fomesafen + Bentazon	0.58	0.0 c	2.5	0.0 d	57.5 ab	87.5 a	75.0 ab	100 a	100 a	110 abc	11.7 a-d
Fomesafen + Agral 90	0.25+ 0.1%v/v	0.0 c	0.0	17.5 cd	0.0 c	75.0 a	92.5 a	50.0 bc	75.0 a	104 abc	11.6bcd
Imazethapyr	0.1	0.0 c	3.8	50.0 bc	100 a	100 a	100 a	45.0 cd	50.0 ab	106 abc	13.3abc
Dinoseb	3.7	0.0 c	0.0	42.5 c	70.0 ab	92.5 a	25.0 bc	47.5 cd	100 a	105 abc	14.1 ab

BYG = Barnyard grass;LQ = Lamb's Quarters;LD = Lady's Thumb;WB = Wild Buckwheat;SHP = Shephard's Purse;PWW = Pineapple Weed
Means with the same letter are not significantly different at the 0.05 level of significance according to Duncan's multiple range test

ALTERNATIVES TO DINOSEB FOR WEED CONTROL IN FIELD PEAS

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ABSTRACT: A trial to evaluate various pre-plant incorporated (ppi),pre-emergence (pre) and post-emergence (post) herbicide treatments was conducted to evaluate possible alternatives to dinoseb in peas . Treatments were applied either alone, in tank mixes, or sequentially . Visual ratings on crop damage and weed control were collected. Crop maturity tenderometer readings and yields were also collected. Initial damage was observed from a number of treatments but as the season progressed, most recovered. By July 12 only BAS 35140, bentazon + assist and metribuzin (0.56 kg(a.i.)/ha) resulted in crop damage levels significantly higher than both the dinoseb and untreated control plots. There were no significant differences between MCPA Amine, MCPA NA salt and MCPB/MCPA treatments, irregardless of water volumes or rates. Crop maturity was delayed with these treatments as compared to dinoseb and the control, however. A number of treatments delayed maturity, but yields were not significantly different. One of the best overall treatments in terms of crop tolerance, weed control, crop maturity and yields was clomazone applied alone ppi.

SUBSTITUTS DU DINOSÈBE POUR LA RÉPRESSION DES MAUVAISES HERBES DANS LES CULTURES DE POIS DES CHAMPS

Résumé: Un essai avait pour but d'évaluer l'aptitude de divers herbicides à remplacer le dinosèbe dans la culture de pois des champs. On a évalué des herbicides incorporés au sol avant la plantation et des herbicides de prélevée et de postlevée, et ils ont été appliqués seuls, dans un mélange ou en application séquentielle. On a fait l'évaluation visuelle des dommages causés aux pois et du taux de répression des mauvaises herbes, en plus de mesurer les rendements et la maturation des pois avec un tendéromètre. Un certain nombre de traitements ont endommagé les jeunes plants, mais la plupart d'entre eux se sont rétablis à mesure que la saison progressait. Le 12 juillet, on a constaté que les applications de BAS 35140, de bentazon + assist et de métribuzine était les seuls traitements qui ont causé aux pois des dommages beaucoup plus considérables que ceux observés dans les parcelles non traitées et que les dommages présents sur les pois traités avec du dinosèbe. On n'a pas relevé d'écart important entre les traitements à l'amine MCPA, au MCPA NA (sels) et au MCPB/MCPA, quels que soient les volumes d'eau ou les taux d'application utilisés. Toutefois, ces traitements ont retardé la maturation des pois par rapport à ceux traités au dinosèbe et aux pois non traités de la parcelle témoin. Certains traitements ont retardé la maturation, mais les rendements n'étaient pas beaucoup différents. Le clomazone appliqué seul avant la plantation a été le traitement qui a donné les meilleurs résultats en général pour ce qui est de la tolérance des pois, de la répression des mauvaises herbes, de la maturation et du rendement.

INTRODUCTION: Currently there are approximately 4500 acres of processing peas grown in New Brunswick as well as a number of acres for the fresh market. The herbicide traditionally used over the years has been dinoseb. The Amine formulation was suspended in 1986 after nitrosamine contamination was verified, leaving only the oil base emulsifiable concentrate registered. This past summer the NB Department of Environment placed a ban on the further use of any dinoseb products within the province as of November 1, 1990.

Dinoseb was a very effective and consistent herbicide and with its loss an effective alternative must be found. A trial was therefore established as a follow-up from last year (McCully et. al, 1989) to evaluate various treatments as possible alternatives. In Maine, growers have used MCPA amine with some success. It was therefore included in the trial to compare it with MCPA NA salt (considered to be less toxic) and MCPB/MCPA(Tropotox Plus). It was felt that high water volumes may be important in reducing crop injury, as it is known that peas are sensitive to MCPA. These products at various rates and water volumes were therefore included in addition to a number of other herbicides to evaluate their efficacy on pea tolerance and weed control.

MATERIALS AND METHODS: 'Bolero' peas were planted June 1, 1990 in a trial at Florenceville, Carleton county. The soil type was a loam with a pH of 6.4 and an organic matter level of 2.7%. Seeding rate was 36.71 kg/ha with a row spacing of 18 cm. 336 kg/ha of 15-15-15 fertilizer was applied. Experimental design was a randomized complete block with four replicates. Plot size was 3m x 6m. Previous crop was potato. Preplant incorporated (PPI) herbicides (see Table 1) were applied June 1 and incorporated 7.5 cm with a roto-tiller. Pre-emergence (PRE) herbicides (see Table 1) were applied June 1 following planting. Post-emergence (POST) herbicides (see Table 1) were applied June 26 when the peas had 3-4 pairs of leaves and weeds were 2-3 cm high. Herbicides were applied using a CO_2 backpack sprayer in a water volume of 250 L/ha for PPI and PRE applications. Most Post treatments were applied in a water volume of 250 L/ha, except for MCPA compounds which were applied in water volumes of 150 L/Ha and 300 L/Ha (see Table 1). Sprayer pressure was 200 kPa. Rainfall was 25 mm seven days before the PPI and PRE applications and 18 mm fourteen days after. Rainfall levels seven days before POST applications were 64 mm and 15 mm fourteen days after. Visual assessments on crop phytotoxicity and weed control were taken June 20, July 2, July 12 and August 2. Harvest was August 2. Logarithmic transformations were performed on yield data and arcsin transformations were performed on visual observations where necessary. Means were separated by Duncan's multiple range test.

RESULTS & DISCUSSION:

Crop Tolerance: At the June 20 (19 days after PPI + PRE applications) assessment date, only four treatments resulted in crop injury significantly higher than the untreated control and dinoseb . These included clomazone (16.3%) trifluralin + MCPA (11.3%), trifluralin (11.3%) and clomazone + trifluralin (10.0%). Clomazone injury was in the form of a white bleaching and trifluralin injury was in the form of stunting. Peas are normally very tolerant to registered rates of trifluralin, however rates used in this trial were 37.5% higher than those registered. Post emergent treatments had not been applied at this time.

By the July 2 assessment date (6 days after POST treatment; 31 days after PPI and PRE treatments) the only treatments not significantly different from the untreated control and dinoseb plots were imazethapyr, trifluralin, clomazone, clomazone + trifluralin and metribuzin (0.42 kg (a.i.)/ha) (see Table 1). Clomazone and trifluralin damage therefore disappeared within a month of application. Significant damage was observed from all post emergent treatments. The most phytotoxic treatments were BAS 35140 (contains bentazon) (51.3%); bentazon + assist (47.5%) and MCPB/MCPA (1.7 kg(a.i.)/ha in 150 L H_2O/ha)(38.8%).

There were no significant differences between the three MCPA amine treatments when comparing them to each other; the three MCPA NA salt treatments when comparing them to each other; or the three MCPB/MCPA treatments when comparing them to each other. These treatments included the highest registered rate at a low and high water volume (150 vs 300 L/Ha) and also an above labelled rate at the high water volume. It was felt that higher water volumes may reduce crop injury. Results indicated that there were no significant differences between the high and low water volumes at the highest labelled rates. In addition the high water volume with above labelled rates did not provide damage levels significantly different than the lower rates at both water volumes. The MCPB/MCPA treatments resulted in the highest levels of damage from treatments containing MCPA, followed by MCPA NA salt and MCPA amine. The differences were not always significant, however. Injury was in the form of pea crop flattening.

By the July 12 assessment, the post-emergent treatments recovered somewhat. At this time the only treatments resulting in damage significantly higher than both the untreated control and dinoseb treatments were BAS 35140 (20%), bentazon + assist (16.3%), and metribuzin (0.56 kg(a.i.)/ha) (14.5%) (see Table 1). Bentazon injury was in the form of a scorching. The treatments containing MCPA therefore recovered to levels not significantly different from each other or the untreated control.

Tenderometer readings were also collected at harvest to give an indication of pea maturity as compared to the control and dinoseb treatments. Treatments with low tenderometer readings would indicate a delay in maturity. Eleven of the treatments resulted in significantly lower tenderometer readings than the untreated control and dinoseb treated plots (see Table 1). MCPB/MCPA applied at the above labelled rate (2.0 kg(a.i.)/ha) resulted in the lowest tenderometer readings followed by the three treatments containing trifluralin, which were also applied at above labelled rates. Other treatments significantly delaying maturity were MCPA NA (0.38 kg(a.i./ha in 150 L H_2O/ha), MCPA NA (0.46 kg(a.i.)/ha in

300 L H_2O/ha), MCPB/MCPA (1.7 kg(a.i.)/ha in 150 L H_2O/ha), all three MCPA amine treatments and BAS 35140. Generally treatments resulting in initial injury delayed maturity somewhat. Yields harvested from plots indicated no significant differences.

WEED CONTROL: Weed control was assessed on a per weed species basis. The major weeds observed in plots were lambs quarters, barnyard grass, lady's thumb, and wild buckwheat. Initial weed densities were low and a thick crop canopy smothered out many weeds, making evaluations more difficult.

LAMB'S QUARTERS: All treatments, except MCPA amine 0.275 kg(a.i.)/ha applied in 150 L water, significantly controlled lamb's quarters as compared to the untreated plots. The remaining treatments controlled lamb's quarters form 75 to 100%, and were not significantly different from dinoseb treated plots.

BARNYARD GRASS: Seven treatments significantly controlled barnyard grass as compared to the untreated control and dinoseb plots (see Table 1). Trifluralin, clomazone, clomazone + trifluralin, and trifluralin + MCPA all resulted in 100% control followed by MCPA NA 0.38 kg(a.i.)/ha in 300 L water/ha (75%) and both metribuzin treatments (65%). Trifluralin, clomazone and metribuzin are known to effectively control annual grasses, so these results were as expected. The MCPA NA treatment is not effective on barnyard grass so it is surprising that control levels were high. It is probable that initial densities were low in these plots.

LADY'S THUMB: Initial lady's thumb densities and distribution was low. As a result, none of the treatments were significantly different from dinoseb treated plots. Eleven treatments resulted in control significantly higher than the untreated plots (see Table 1).

WILD BUCKWHEAT: Four treatments resulted in significantly higher wild buckwheat control than the untreated plots. These included trifluralin + MCPA, clomazone + trifluralin, clomazone, and trifluralin. These treatments all provided 100% control and were not significantly different from the dinoseb treated plots.

CONCLUSIONS: Initial damage was observed from many treatments but as the season progressed peas generally recovered. By July 12 (16 days after POST treatments and 41 days after PPI and PRE treatments) the only treatments resulting in significant crop injury as compared to the untreated control and dinoseb plots were BAS 35140 (contains bentazon and a surfactant pre-mixed) (20.0%), bentazon + assist (16.3%) and metribuzin (0.56 kg(a.i.)/ha (14.5%). Yields from these treatments were relatively low in comparison with dinoseb and the control, but not significantly.

Initial damage was observed from clomazone treated plots, but within 31 days they recovered. Trifluralin damage was also observed early, due to higher than registered rates. Trifluralin delayed maturity when examining tenderometer ratings. A comparison between MCPA amine, MCPA NA and MCPB/MCPA revealed very little difference. MCPB/MCPA appeared to be slightly more phytotoxic than MCPA NA and MCPA amine respectively. Injury was observed as a flattening of the crop. As the season progressed, differences were not significant however. Water volumes do not appear important when using labelled rates of MCPA amine, MCPA NA salt and MCPB/MCPA. The use of a high and low water volume at the highest recommended rate, resulted in no significant differences when evaluating crop injury, tenderometer readings or yields. The high water volume with above labelled rates did not provide damage levels significantly higher than the lower rates at both water volumes. It is difficult to conclude however, that high water volumes may reduce injury at above labelled rates since a low water volume was not used for comparison. MCPA amine, MCPA NA salt and MCPB/MCPA all delayed maturity as compared to the untreated control and dinoseb, but not always significantly. The low weed populations may have made comparisons between the MCPA amine, MCPA NA salt and MCPB/MCPA more difficult. Crop tolerance varied little between the products but weed control may have varied significantly under a heavier pressure. It would be expected that MCPB/MCPA would provide the best weed control followed by MCPA NA salt and then MCPA amine. Results from this trial did not indicate this, however.

Treatments containing trifluralin resulted in excellent weed control but resulted in high initial crop injury and significantly delayed pea maturity. Clomazone was one of the best treatments in terms of crop tolerance, weed control, maturity and yields. There was very little difference between MCPA amine, MCPA NA salt and MCPB/MCPA in terms of weed control.

ACKNOWLEDGEMENTS: Appreciation is extended to employee's of McCains who assisted with the trial.

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Table 1 - Crop damage, Weed Control, Tenderometer Results and Yields

Water Volume L/Ha	Treatment	Rate kg(a.i.) /ha	Timing	Crop Damage (07 02 90)	Crop Damage (07 12 90)	LQ Control (08 02 90)	Barnyard Grass control (08 02 90)	Ladies Thumb Control (08 02 90)	Wild Buckwheat Control (08 02 90)	Tenderometer results	Yield (Tons/ha)
-	Control	-	-	0.0 e	0.0 e	0 b	0 b	25 b	25 bc	129 ab	7.35 NS
250	Dinoseb	3.7	Pre	0.0 e	3.3 cde	75 a	0 b	75 ab	50 abc	129 ab	7.10
250	Metribuzin	0.42	Pre	12.5 cde	7.5 cd	100 a	65 a	100 a	75 ab	125 abc	6.08
250	Metribuzin	0.56	Pre	26.3 bc	14.5 ab	100 a	65 a	100 a	25 bc	123 a-e	5.80
250	Trifuluralin	1.1	PPI	0.0 e	5.8 cde	100 a	100 a	100 a	100 a	114 fg	5.45
250	Bentazon + Assist	1.1 + 2.0	Post	47.5 a	16.3 ab	75 a	0 b	100 a	50 abc	123 a-e	5.45
250	BAS 35140	1.08	Post	51.3 a	20.0 a	100 a	0 b	100 a	50 abc	120 c-g	5.06
250	Clomazone	0.75	PPI	5.0 de	5.0 cde	75 a	100 a	100 a	100 a	123 a-e	6.97
250	Clomazone + Trifluralin	0.75 + 1.1	PPI	5.0 de	6.3 cde	100 a	100 a	100 a	100 a	113 fg	7.15
250	Imazethapyr	0.10	Pre	0.0 e	5.0 cde	100 a	0 b	75 ab	50 abc	131 a	6.51
250	Trifluralin; MCPA amine	1.1;0.25	PPI;Post	25.0 bc	10.0 bc	100 a	100 a	100 a	100 a	114 fg	5.72
150	MCPA amine	0.275	Post	20.0 cd	2.5 de	25 b	0 b	100 a	0 c	117 c-g	6.16
300	MCPA amine	0.275	Post	20.0 cd	3.8 cde	75 a	0 b	25 b	50 abc	118 c-g	6.16
300	MCPA amine	0.35	Post	20.0 cd	0.0 e	100 a	0 b	50 ab	25 bc	117 c-g	7.52
150	MCPA Na Salt	0.38	Post	27.5 bc	3.8 cde	75 a	0 b	50 ab	25 bc	114 efg	7.18
300	MCPA Na Salt	0.38	Post	25.0 bc	1.3 de	100 a	75 a	100 a	25 bc	121 b-g	6.85
300	MCPA Na Salt	0.46	Post	25.0 bc	3.3 cde	100 a	25 b	75 ab	50 abc	114 d-g	6.42
150	MCPB/MCPA	1.7	Post	38.8 ab	4.5 cde	100 a	0 b	75 ab	50 abc	115 d-g	6.18
300	MCPB/MCPA	1.7	Post	25.0 bc	5.0 cde	100 a	0 b	75 ab	50 abc	122 a-f	6.80
300	MCPB/MCPA	2.0	Post	30.0 bc	2.5 de	100 a	0 b	100 a	0 c	112 g	6.51

Means with the same letter are not significantly different at the 0.05 level of significance according to Duncan's multiple range test

EVALUATION OF POTATO TOP KILLERS

K.V. McCully, M. Mann, D. Hanscomb, and J. Lavoie

ABSTRACT: A trial to evaluate and compare three new potential potato topkillers with diquat was conducted. Visual assessments on leaf and stem desiccation, yields and specific gravity were collected. Results indicated that diquat treatments resulted in the fastest leaf and stem desiccation. This was followed by UBI 9086 and HOE 39866 treatments, of which there was very little difference. By the final assessment date all treatments except lactofen resulted in over 85% leaf and 78% stem desiccation and were not significantly different from one another. HOE 39866 and UBI 9086 were therefore as effective as diquat in desiccating the potato tops. Specific gravity readings indicated that the treatments with the fastest topkill, resulted in the lowest specific gravity readings. No clear trends were observed from yield data.

ÉVALUATION DE DÉFANANTS

Résumé: Un essai a eu lieu pour évaluer et comparer l'efficacité de trois nouveaux défanants possibles et du diquat. On a fait l'évaluation visuelle de la dessiccation des feuilles et des tiges, du rendement et de la densité relative. Les résultats ont indiqué que le diquat provoquait la dessiccation la plus rapide des feuilles et des tiges, suivi de très près par le HBI 9086 et le HOE 39866. À la date de la dernière évaluation, tous les produits sauf le lactofen avaient causé la dessiccation de 85 p. 100 des feuilles et de 78 p. 100 des tiges, sans constater d'écarts importants entre eux. On a donc conclu que le HOE 39866 et le UBI 9086 étaient aussi efficaces que le diquat pour le défanage. Les lectures de la densité relative indiquent que les traitements au défanant le plus rapide correspondaient à la densité relative la plus faible. Les données recueillies pour le rendement n'ont pas permis d'établir une tendance définie.

INTRODUCTION: One of the common production practices associated with potato growing is top killing. Top killers are used to facilitate potato harvesting, control tuber size, reduce skinning, and reduce losses due to diseases. A relatively slow but complete kill of the potato leaves and vines is most desirable. This type of kill will produce the highest quality tubers (high starch content), permit some additional tuber sizing and provide conditions for a good skin set (Advisory Committee on Potatoes, 1987). A slow kill will also allow tubers to continue converting sugars to starch, something vital to good processing quality. Top killing is therefore considered to be very important.

The banning of dinoseb by the N.B. Department of Environment(effective Nov.1,1990),has left only one product,diquat, registered for potato top killing.There have been some concerns expressed from the use of diquat and as a result it is felt that other potential products should be evaluated. A trial was therefore initiated to evaluate various herbicides as potential potato top killers.

MATERIALS AND METHODS: The trial was established in a commercial planting of Russet Burbank potatoes in Bedell, Carleton county,
N.B.. Potatoes were planted in a silt-clay loam soil having a pH of 6.4 and an organic matter level of 3.9%. Experimental design was a randomized complete block with four replicates. Plots contained three 5 m long rows with results taken from the centre row only. The two outer

rows served as guards. Treatments (see table 1) were applied September 14 with a CO_2 backpack sprayer in a water volume of 300 L/Ha. Sprayer pressure was 200 kPa. Visual assessments on leaf and stem desiccation were taken September 17, September 20 and October 2. Yields were taken October 2 from the centre row in each plot. Logarithmic transformations were performed on yields and arcsin transformations were performed on the visual observations where necessary. Means were separated using Duncan's multiple range test.

RESULTS AND DISCUSSION:

Leaf & Stem Desiccation

Leaf and stem desiccation ratings were taken to give a visual indication of treatment efficacy. September 17 leaf desiccation ratings (3 days after application) indicated that all treatments except lactofen resulted in significant leaf desiccation as compared to the untreated control. Desiccation ratings ranged from 28.8 to 72.5% for the treatments which were significantly higher than the control. The two fastest reacting treatments were diquat 0.84 kg(a.i.)/ha (72.5%) and diquat 0.42 kg(a.i.)/ha (60.0%) (See Table 1). Stem desiccation ratings at this time were much lower as none of the treatments resulted in over 10% desiccation.

Leaf and stem desiccation ratings collected September 20 (6 days after application) indicated that all treatments further increased top kill levels. All treatments resulted in significantly higher desiccation levels than the control. Leaf desiccation ratings ranged from 46.3% to 91.3% and stem desiccation ratings from 17.5 to 38.8%. The high and low rate of diquat continued to provide the highest percentage leaf (91.3%, 86.3%) and stem(38.8%,33.8%) desiccation levels respectively (see Table 1). Overall at this time diquat treatments resulted in the highest leaf desiccation followed by Hoe 39866, UBI 9086 and lactofen. Differences were not always significant however. Differences were less evident from stem desiccation ratings, as treatments other than diquat were not significantly different from one another.

By the final rating period, October 2, (18 days after application) differences between treatments were less evident. All treatments remained significantly higher than the untreated control plots for both leaf and stem desiccation. Treatments resulting in over 85% leaf topkill included diquat (0.84 kg(a.i.)/ha) (100%); diquat (0.42 kg(a.i.)/ha (100%); Hoe 39866 (0.55 kg(a.i.)/ha) (100%); UBI 9086 (0.14 kg(a.i.)/ha (90.0%); UBI 9086 (0.07 kg(a..)/ha) (90.0%); and Hoe 39866 (0.45 kg (a.i.)/ha) (88.8%). These treatments were not significantly different from one another, however. Lactofen resulted in the lowest level of top kill (68.8%), only slightly higher than the control (52.5%). Top kill in the control plots were the result of natural senescence and slight frosts.

Stem desiccation ratings at the final assessment date were similar to leaf desiccation ratings, with the treatments providing the highest levels of leaf desiccation also providing the highest stem desiccation levels. All treatments except lactofen resulted in over 78% stem desiccation, and were not significantly different from one another.

Overall, diquat treatments resulted in the fastest leaf and stem desiccation followed by Hoe 39866 and UBI 9086 treatments. There was very little difference between the UBI 9086 and Hoe 39866 treatments, however. Lactofen was the slowest reacting of all the treatments evaluated. The lower rates of UBI 9086, diquat and Hoe 39866 were just as effective as the higher rates.

SPECIFIC GRAVITY

Specific gravity was measured to give an indication of potato quality and therefore starch content. The higher the starch content the higher the potato quality. If a potato top killer works too fast there will be less translocation of sugars from the upper plant parts to the tuber, where the sugar is converted to starch. Therefore the faster the topkill, the lower the specific gravity, the lower the starch content,and the lower the quality. Generally, depending upon conditions, specific gravity of Russet Burbanks range from 1.085 to 1.090.

Specific gravity readings, although not significantly different from one another, indicated that all treatments reduced specific gravity as compared to the untreated control. The two lowest specific gravity readings came as expected from the two fastest acting topkiller treatments, diquat (0.84 and 0.42 kg(a.i.)/ha). The untreated control plots had the highest specific gravity (1.087). The remaining treatments were all very close with specific gravity readings between 1.081 and 1.083.

YIELDS

Yield data indicated that the highest yielding treatment was diquat (0.84 kg(a.i.)/ha) (52.32 T/ha) followed by the untreated control (50.35 T/ha). The diquat 0.84 kg(a.i.)/ha treatment high yields were unexpected as it had the fastest topkill, which would have expectedly reduced tuber sizing. Only one treatment, HOE 39866 (0.55 kg(a.i.)/ha) resulted in significantly lower yields than the untreated control. Diquat at the lower rate (0.42 kg(a.i.)/ha) was surprisingly and unexplainably lower in yield than the full rate of diquat. The lower rate of UBI 9086 and HOE 39866 resulted in yields greater than the high rates of these products but not significantly. Extremes in climatic conditions throughout the growing season may have accounted for some of the variations in yields.

CONCLUSIONS: Overall the fastest leaf and stem desiccation resulted from the two diquat treatments. This was followed by Hoe 39866 and UBI 9086 treatments, of which there was little difference. Lactofen was the slowest reacting of treatments tested. By October 2, all the treatments except the control and lactofen resulted in over 85% leaf and 78% stem desiccation. These treatments were not significantly different from one another. The lower rates of UBI 9086, diquat and Hoe 39866 were just as effective as the higher rates. Control plots had a natural leaf and stem desiccation of 52.5 and 28.8% respectively.

To determine the treatments effects on quality, specific gravity was taken. The highest specific gravity and quality, resulted from the untreated control. Although having the highest specific gravity at this time it is possible that problems such as disease infestation and increased bruising could develop and appear when in storage. The treatments with the fastest topkill activity (diquat) resulted in the lowest specific gravity. This was expected since less sugar would translocate to the tubers and be converted to starch with a rapid knockdown. Yields varied between treatments, but the only treatment significantly lower than the untreated control was HOE 39866 (0.55 kg(.ai.)/ha). This and the fact that the low diquat rate resulted in significantly lower yields than the high rate is surprising. It is felt that extremes in climatic conditions throughout the growing season may have been responsible for these unexpected results.

Based on the preliminary results, it appears that a slightly higher quality potato may be expected from potatoes not treated with diquat. The UBI 9086 and Hoe 39866 treatments, although initially slower reacting than diquat, were still effective as top killers. By the last assessment date there were no significant differences between these treatments and diquat. Lactofen was very slow in desiccating tops as compared to the rest. More work needs to be conducted to further evaluate the topkillers.

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TABLE 1- YIELDS, SPECIFIC GRAVITY AND LEAF AND STEM DESICCATION RATINGS

	treatment	rate kg a.i./ ha	Sept. 17 3 days after application		Sept. 20 6 days after application		Oct. 2 18 days after application		YLD	S.G.
			LD	SD	LD	SD	LD	SD	MT/ha	
1	Control	-	7.5 d	2.5 c	16.3 e	5.0 c	52.5 c	28.8 c	50.35 ab	1.087 n.s.
2	UBI 9086	.07	28.8 c	6.3b	62.5c	20b	90a	81.3a	46.17abc	1.082
3	UBI 9086	.14	36.3c	5 bc	66.3bc	23.8b	90 a	78.8a	41.38 bc	1.081
4	diquat	.84	72.5a	10a	91.3 a	38.8a	100 a	98.8 a	52.32a	1.078
5	diquat	.42	60 b	10 a	86.3 a	33.8 a	100 a	98.8 a	43.21 abc	1.080
6	Hoe 39866	.45	30 c	3.8 bc	71.3bc	21.4b	88.8a	87.5a	49.40 abc	1.083
7	Hoe 39866	.55	33.8 c	5.0 bc	73.8b	17.5 b	100	96.3a	40.47 c	1.081
8	Lactofen	0.50	13.8d	5 bc	46.3 d	18.8b	68.8b	52.5 b	50.35 ab	1.082

Means with the same letter are not significantly different at the 0.05 level of significance according to Duncans Multiple Range Test.
LD= leaf dessication ; SD= stem dessication
S.G.= specific gravity

QUACKGRASS CONTROL IN ESTABLISHED ALFALFA

K.V. McCully, M.A. Mann and D.O. Hanscomb

ABSTRACT: A trial to evaluate various registered and non-registered products on their effectiveness in controlling quackgrass with no associated crop damage was conducted. Visual ratings on crop damage and quackgrass control were collected in addition to quackgrass shoot densities, alfalfa yields and botanical composition. No crop damage was observed from any of the treatments evaluated. Treatments containing RO17-3664 + Renex 36, UBI 9076 + C.O.C and DPX Y6202 appeared the most promising. Three of the best individual treatments in most rating categories was Ro 17-3664 + Renex 36 (0.15 kg(a.i.)/ha + 0.25% v/v) and UBI 9076 (0.15 and 0.20 kg(a.i.)/ha + 1.0% v/v).

RÉPRESSION DU CHIENDENT DANS LES CHAMPS DE LUZERNE EN CULTURE

Résumé: Un essai a permis d'établir l'efficacité contre le chiendent de divers produits homologués et non homologués qui n'endommagent pas la luzerne. On a fait l'évaluation visuelle des dommages causés à la luzerne et du taux de répression du chiendent, en plus de mesurer la densité des pousses de chiendent et d'évaluer le rendement de la luzerne et la composition botanique du champ. Aucun des traitements évalués n'a causé de dommage à la luzerne. Ceux qui offrent les meilleures perspectives sont les produits à base de RO17-3664 + Renex 36, de 9 UBI 9076 + C.O.C. et de DPX Y6202. Deux des meilleurs traitements individuels dans la plupart des doses appliquées sont le Ro 17- 3664 + Renex 36 (0,15 kg d'ingrédient actif par hectare + 0,25 % v/v) et le UBI 9076 (0,15 et 0,20 kg d'ingrédient actif par hectare + 1 % v/v).

INTRODUCTION: Quackgrass is a serious perennial weed of many crops, including alfalfa throughout New Brunswick. One plant can produce up to 300 feet of rhizomes and 200 shoots in a single season (Hay, 1962). Losses due to quackgrass in alfalfa are associated with establishment, stand longevity, quality, animal utilization and increased problems in rotational crops (Leroux, 1987). If quackgrass competes with the legume during the seedling year, you can expect a weaker thinner and less productive stand. As a result it shortens the productive life of the stand and forces growers to renovate their fields earlier than when adequate control measures are applied. The quality of a forage may also be reduced and constitute a major source of loss, as quackgrass lowers the nutritive value of harvested forages. With the increased emphasis on alfalfa production within New Brunswick, quackgrass will be one of the more serious weeds in terms of reducing stand longevity. A trial was therefore established as a follow up to trials conducted the last two years (McCully, et.al., 1988 and 1989) to evaluate various graminicides on their efficacy in controlling quackgrass.

MATERIALS AND METHODS: This trial was established in Sussex, Kings County in a sandy loam soil having a pH of 7.2, an organic matter content of 3.2% and a sand/silt/clay ratio of 45:48:7. O.A.C. Minto alfalfa was planted on May 20, 1987 at a seeding rate of 13.64 kg/ha. 340 kg/ha of 5-10-30 fertilizer was applied. Experimental design was a randomized complete block with four replicates. Plot size was 2m x 6m. Previous crop was alfalfa. Herbicides (see table 1) were applied May 25, 1990 when the alfalfa was 25 cm high and the quackgrass was in the 3-4 leaf stage. Herbicides were applied using a CO_2 backpack sprayer in a water volume of 200 L/ha at a pressure of 200 kPa. Rainfall was 68 mm, seven days prior to application and 41mm, seven days after. Visual assessments on crop phytotoxicity and weed control were taken on June 6 and July 26. Harvests were taken June 28 and August 16. Density counts were taken in permanent 50 cm^2 quadrats on June 6th, to give an indication of initial quackgrass densities. Density counts were taken again August 10th, to evaluate quackgrass density reductions. Arcsin transformations were performed on the visual observations where necessary and logarithmic transformations were performed on the densities and yields. Means were separated by Duncan's multiple range test.

RESULTS & DISCUSSION:

Crop Damage

None of the treatments resulted in any alfalfa damage during the assessment dates.

Quackgrass Control

All treatments significantly injured quackgrass as compared to the untreated control 14 days after application. Control ranged from 17.5% to 21.25% and were not significantly different from one another. Quackgrass heights measured at the time indicated that all treatments significantly reduced height as compared to the untreated control. Although varying slightly they were not significantly different from one another.

By July 26 (62 days after application and 28 days after the first harvest) all treatments continued to significantly control quackgrass as compared to the untreated plots (see Table 1). Treatments resulting in over 75% control, although not significantly different from one another included: DPX Y6202 + Canplus 411 (76.3%); RO 17-3664 + Renex 36 (0.075 kg(.ai.)/ha + 0.25 % v/v) (78.3%) UBI 9076 + C.O.C (0.12 kg(a.i.)/ha + 1% v/v (82.5%); UBI 9076 + C.O.C (0.105 kg(a.i.)/ha + 1%v/v) (84.5%); RO17-3664 + Renex 36 (0.10 kg(a.i.)/ha + .25% v/v) (87.5%), UBI 9076 (0.150 kg(a.i.)/ha + 1% v/v) (87.5%) and RO17-3664 + Renex 36 (0.150 kg(a.i.)/ha + 0.25% v/v) (89.5%). In general terms, fluazifop treatments resulted in better control than sethoxydim treatments which were better than the clethodim treatments.Treatments containing RO17-3664 were marginally better than UBI 9076 treatments, but not significantly.

Pre-treatment quackgrass density counts varied from treatment to treatment but were not significantly different from one another. This indicated that a relatively consistent and uniform quackgrass stand existed at the trial site. Just prior to the second harvest, density counts were collected again, to give an indication of treatment efficacy. All the treatments caused a reduction in quackgrass densities, but only DPX Y6202 + Canplus 411, UBI 9076 (0.120 kg(a.i.)/ha + 1.0% v/v) and Ro 17-3664 + Renex 36 (0.150 kg(a.i.)/ha + 0.25 % v/v) resulted in densities significantly lower than the untreated control.

Treatments resulting in quackgrass density reductions of over 80% included DPX Y6202 (89.9%), RO17-3664 + Renex 36 (0.15 kg(a.i.)/ha) (88.5%), UBI 9076 + C.O.C (0.120 kg (a.i.)/ha + 1.0% v/v) (88.0%); Ro17-3664 + Renex 36 (0.100 kg(a.i)/ha + 0.25% v/v (84.3%), UBI 9076 + C.O.C (0.150 kg(a.i.)/ha + 1.0% v/v) (83.1%) and UBI 9076 + C.O.C (0.105 kg(a.i.)/ha + 1.0% v/v)(80.8%).

Overall, treatments containing UBI 9076, RO 17-3664 and DPX Y6202 resulted in the best quackgrass control. There were no significant differences between the various rates of these treatments or the treatments themselves. RO 17-3664 treatments were however marginally better than UBI 9076 treatments. There were no significant differences between the different formulations of fluazifop-p-butyl, the different surfactant rates mixed with clethodim; or the different surfactants mixed with sethoxydim.

Crop Yields and Botanical Composition

When examining alfalfa yield data, it is important to remember that yields include alfalfa, grass and broadleaf weeds all combined. Although it is not necessarily undesirable to have a number of grasses or broadleaf weeds mixed in with alfalfa, the objective of this trial was to obtain as weed free alfalfa as possible. Therefore the highest yielding treatments are not necessarily the best since it includes weeds and not only pure alfalfa. Only one treatment sethoxydim + Assist resulted in yields significantly higher than the untreated control.

To give a better indication of plot yields, botanical compositions were determined. It must be remembered however, that botanical compositions do not necessarily give a breakdown of the yields by weight since it is based on counts. For example there may be 30% broadleaf weeds, but they would weigh more than 70% alfalfa. However in this trial, the botanical composition is felt to be a fairly accurate percentage breakdown of yields. When this is considered, the highest yielding pure alfalfa treatment resulted from the UBI 9076 + C.O.C (0.120 kg(a.i.)/ha + 1.0% v/v) (17.6 T/ha x 78.6% alfalfa = 13.8 T/ha pure alfalfa), followed by UBI 9076 + C.O.C (0.150 kg(a.i.)/ha + 1.0% v/v) (13.5 T/ha) and RO17 - 3664 + Renex 36 (0.150 kg(a.i.)/ha + .25% v/v) (13.3 T/ha). In general, the treatments with the lowest quackgrass shoot densities and highest percent control had the highest yielding pure alfalfa, as would be expected.

CONCLUSIONS: Alfalfa was very tolerant to all treatments tested. All treatments significantly controlled quackgrass as compared to the untreated control. Treatments providing acceptable levels of control, and not significantly different from one another based on visual ratings included DPX Y6202 + Canplus 411, all UBI 9076 + C.O.C. and RO17 - 3664 + Renex 36 treatments. RO17-3664 + Renex 36 treatments were slightly better than UBI 9076 + C.O.C. treatments, which were better than the DPX Y6202 treatment. These treatments were consistently the most effective treatments when examining quackgrass control, quackgrass density reduction and pure alfalfa yields. The lower rates of the RO17-3664 and UBI 9076 treatments were less effective than the higher rates, but not always significantly less. Fluazifop-p-butyl treatments were the next best after the above RO-17 3664, UBI 9076 and DPX Y6202 treatments followed by sethoxydim and clethodim treatments. There were no significant differences between the two different fluazifop-p-butyl, sethoxydim or clethodim treatments. Three of the best individual treatments in most rating categories were Ro17-3664 + Renex 36 (0.15 kg(a.i.)/ha + .25% v/v) and UBI 9076 + C.O.C (0.15 and 0.20 kg (a.i.)/ha + 1.0% v/v).

REFERENCES

Hay, J.R. 1962. Biology on quackgrass and some thoughts on its control. Down Earth. 18:14-16.

Leroux, G. 1987. Problems and losses caused by quackgrass in forage crops. In quackgrass Action Committee Workshop Technical Proceedings, H. Glick ed. March 10 and 11, 1987. Winnipeg. Manitoba.

McCully, K.V., L. Cornish, S.J. Leblanc and D.O. Hanscomb. 1988 Quackgrass control in established Alfalfa. 1988 Adaptive Research Report. 10:122-129

McCully, K.V., D.O. Hanscomb and M.A. Mann. 1989 Quackgrass control in established alfalfa. 1989 Adaptive Research Reports. 11:143-148

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Table 1. Visual Evaluations, Densities and Yields

TREATMENT	RATE KG(A.I.) /HA	% CROP DAMAGE 0726	% QUACKGRASS CONTROL 0726	QUACK DENSITIES Prespray m^2 0605	QUACK DENSITIES Pre2nd m^2 0816	FORAGE YILEDS T/HA 2nd cut 0816	BOTANICAL COMPOSITION Pre 2nd Cut % Alf.	BOTANICAL COMPOSITION Pre 2nd Cut % Quack	BOTANICAL COMPOSITION Pre 2nd Cut % Weed
Fluazifop-p-butyl + S.O.C.	0.25+1.0% v/v	0.0	55.0 cd	316N.S.	68 a-d	17.4 ab	73.1 N.S.	18.3N.S.	8.6 N.S.
Fluazifop-p-butyl	0.25	0.0	70.0 bc	284	76 a-d	16.8 b	75.3	21.3	3.4
Clethodim + CC 16255	0.09 + 0.5% v/v	0.0	31.3 e	316	112 abc	16.8 b	68.3	27.7	4.0
Clethodim + CC 16255	0.09 + 1.0% v/v	0.0	30.0 e	336	140 a	18.0 ab	62.0	32.4	5.6
Sethoxydim + BCH890	0.5 + 2.0 L/ha	0.0	31.3 e	284	88a-d	16.1 b	71.6	21.5	6.9
Sethoxydim + Assist + Ammonium Sulfate	0.5 +2.0 l/ha	0.0	38.8 de	212	96 a-d	19.7 a	65.1	27.9	7.0
UBI 9076 + C.O.C.	0.105 + 1% v/v	0.0	84.5 ab	272	52 bcd	15.7 b	75.0	15.5	9.5
UBI 9076 + C.O.C.	0.12 + 1% v/V	0.0	82.5 ab	268	32 cd	17.6 ab	78.6	10.7	10.7
UBI 9076 + C.O.C.	0.15 + 1% v/v	0.0	87.5 a	308	52 bcd	17.5 ab	76.9	14.3	8.8
Ro17 - 3664 + Renex 36	0.10 + .25% v/v	0.0	87.5 a	408	64 bcd	15.0 b	71.2	20.0	8.8
Ro17 - 3664 + Renex 36	0.15 + .25% v/v	0.0	89.5 a	244	28 d	15.8 b	84.0	8.0	8.0
Ro17 - 3664 + Renex 36	0.075 + .25% v/v	0.0	78.3 ab	376	84 a-d	17.1 ab	68.9	23.3	7.8
DPX Y6202 + Canolus 411	0.144 + 1% v/v	0.0	76.3 ab	432	44 cd	16.8 b	77.7	12.9	9.4
Control	-	0.0	0.0 f	356	128 ab	15.2 b	58.8	33.0	8.2

Means with the same letter are not significanlty different at the 0.05 level of significance according to Duncan's multiple range test

CROP TOLERANCE AND WEED CONTROL IN SWEET WHITE LUPINES

K.V. McCully, M.A. Mann and D.O. Hanscomb

ABSTRACT: Three trials, two in Cornhill, King's Co. and the one in Sackville, Westmorland Co. were established to evaluate various herbicides for weed control and crop tolerance in sweet white lupines. One of the trials in Cornhill evaluated pre-emergence(pre) herbicides and the other mostly pre-plant incorporated(ppi) herbicides . The Cornhill pre-emergence trial was also replicated in Sackville. Visual assessments on weed control and crop tolerance in addition to lupin plant counts and yields (beans yield - Cornhill; silage/biomass - Sackville) were collected where possible. Results indicated that treatments containing metribuzin were the only treatments resulting in significant crop injury in any of the three trials at any assessment date. Initial injury was in the form of stunting. Analysis of yield and plant density data where collected, indicated that the injury did not adversely affect yield or plant germination in comparison to the untreated control. Weed control was unacceptable at both Corn Hill trial sites due to the large number of perennial weeds. Lamb's quarters, wild buckwheat and chickweed were all significantly controlled by all treatments at the Sackville site. Weed control was slightly better from metribuzin treatments, but not always significantly. There were very little difference between treatments when evaluating weed control, lupin plant counts or yield data from the two pre-emergence trials. Lupins were very tolerant to all the ppi herbicides evaluated.

TOLÉRANCE DES PLANTES ET RÉPRESSION DES MAUVAISES HERBES DANS LES CULTURES DE LUPINS BLANCS DOUX

Résumé: Trois essais ont eu lieu pour évaluer divers produits servant à la répression des mauvaises herbes dans les cultures de lupins blancs doux ainsi que la tolérance des lupins à ces herbicides, soit deux essais à Cornhill, comté de Kings, et un essai à Sackville, comté de Westmorland. Un des essais menés à Cornhill avait pour but d'évaluer des herbicides de prélevée, et l'autre touchait principalement les herbicides appliqués avant la plantation. Un essai d'herbicides de prélevée a aussi eu lieu à Sackville. On a fait l'évaluation visuelle du taux de répression des mauvaises herbes et de la tolérance du lupin, en plus de mesurer le nombre de plants de lupin et les rendements (rendement de haricot à Cornhill et rendement d'ensilage/de biomasse à Sackville). Les résultats ont indiqué que les traitements à base de métribuzin ont été les seuls qui ont causé des dommages importants à la culture dans les trois essais et à n'importe quelle date d'évaluation. On a d'abord observé un rabougrissement des lupins. L'analyse des données sur le rendement et la densité de plants a indiqué que les dommages n'ont pas été plus négatifs pour le rendement ou la germination que dans la parcelle témoin non traitée. La répression des mauvaises herbes n'était pas satisfaisante dans les deux essais menés à Cornhill à cause du grand nombre de mauvaises herbes vivaces présentes. Tous les traitements appliqués à Sackville ont favorisé une grande répression du chénopode blanc, de la renouée liseron et du céraiste vulgaire. La répression des mauvaises herbes a été un peu meilleure avec le métribuzin, mais l'écart n'était pas toujours considérable. On n'a pas constaté de très grande différence entre les traitements dans les deux essais d'herbicides de prélevée lorsqu'on a évalué la répression des mauvaises herbes, le nombre de plants de lupin ou le rendement. Les lupins ont été très tolérants à tous les herbicides appliqués avant la plantation.

INTRODUCTION: Lupines are an annual legume crop currently being evaluated in New Brunswick as a high protein, high fibre and low oil crop. Weed control is one of the major limiting factors in lupin production. Poor weed control can result in reduced yields through competition, in addition to interfering with harvest.

At the time the trials were established, no herbicides were registered for use in lupines. Since then linuron and most recently, metribuzin, have become registered through the Minor Use Program. The trials were conducted to evaluate these and other herbicides on lupines grown in New Brunswick. Three trials were established, one of which evaluated mostly pre-plant incorporated (ppi) herbicides. The other two were replicates of each other and evaluated a number of pre-emergence (pre) herbicides.Data generated will help support the registration process and demonstrate their effectiveness on weed control and crop tolerance in lupines. The two replicated pre-emergence trials are a continuation from last year (see McCully et.al.,1989).

MATERIALS AND METHODS: Three separate trials to evaluate preplant (PPI) and preemergence (PRE) herbicides on sweet white lupines was conducted.

A) The first trial (Cornhill PRE trial), was established in Cornhill, King's Co., New Brunswick. It was established in a silt loam soil having a pH of 6.8, an organic matter content of 3.0 and a soil ratio of 21% sand: 67% silt: 13% clay. Ultra sweet white lupines were planted May 3, 1990 at a seeding rate of 202 kg/ha. Previous crop was alfalfa. Pre emergence herbicides(see table 1) were applied May 3, 1990. Rainfall was 0 mm seven days prior to application and 104.3 mm fourteen after. On June 14, fluazifop-p-butyl was applied over the entire trial to control a quackgrass infestation. Visual evaluations on crop phytotoxicity and weed control were taken June 1, June 19, June 29 and September 11. Yields were taken October 18 and stored to dry at 48 degrees celsius. Crop emergence densities were taken June 1, in a 6 $m^{2\ area}$.

B) The second trial (Sackville PRE trial -replicate of the Cornhill PRE trial) was established in Sackville, Westmorland Co., New Brunswick. It was established in a silt loam soil having a pH of 5.4, an organic matter content of 4.6% and a 34.1% sand:48.0% silt:17.9% clay ratio. Ultra sweet white lupines were planted May 26, 1990 at a seeding rate of 157 Kg/ha. Previous crop was pasture. PRE herbicides (see table 2) were applied June 12, 1990. Fluazifop-p-butyl was applied over the trial, July 5, to control a quackgrass infestation. Rainfall was 0.6 mm seven days prior to PRE application and 14.3 mm fourteen days after. Visual evaluations on crop phytotoxicity and weed control were taken July 11 and August 9. Density counts were taken in $6m^2$ areas, July 11. Harvest was taken as fresh weight September 18, 1990. Due to high lamb's quarters densities, weeds were pulled out of plots, prior to harvest. This was to give better indication of actual lupin silage yields.

C) The third trial (Cornhill PPI Trial), was established in a silt loam soil in Cornhill, King's Co., New Brunswick. Ultra sweet white lupines were planted May 3, 1990 at a seeding rate of 202 kg/ha. Previous crop was alfalfa. Preplant incorporated (PPI) and Preemergence herbicides (see table 3) were applied May 3, 1990. PPI herbicides were incorporated with a roto-tiller to a depth of 7.5 cm. Rainfall was 0 mm seven days prior to

PPI application and 104.3 mm fourteen days after. Visual assessments on crop phytotoxicity and weed control were taken June 1, June 19, and June 29. No yields were available from the PPI trial due to unexpected ploughing of the field containing the trial. Crop emergence densities were taken June 1 in an area of $6m^2$.

Experimental design for the three trials consisted of a randomized complete block with four replicates. Plot size was 2 m x 6 m. The herbicides were applied using a CO_2 backpack sprayer in a water volume of 300 L/ha at a pressure of 200 kPa. Analysis of variance was performed on all data and the means were separated by Duncan's multiple range test.

RESULTS AND DISCUSSION:

CROP TOLERANCE

A) Cornhill and Sackville preemergence trials

Crop tolerance ratings were to be collected from both trials at approximately 30 and 60 days after treatment application. Due to the wet and cool spring, lupin emergence was delayed at the Cornhill site. By the 30 day period lupines had just emerged through the soil and no differences could be detected at this stage. Crop tolerance ratings were therefore taken in Cornhill at 47 days after application instead.

In both the Sackville and Cornhill trial the only treatments resulting in significant crop damage at any assessment date were those containing metribuzin. All other treatments resulted in no significant damage at any time throughout the season.

In the Cornhill trial, 47 days after application, metribuzin applied at 1.0, 0.75 and 0.5 kg (a.i.)/ha resulted in significant crop injury levels of 28.8%, 22.5% and 15% respectively(see table 1). Fifty-seven days after application (June 28), injury levels further increased to 37.5%, 31.3% and 22.5% respectively. One further rating was taken September 11, 131 days after application. Injury levels decreased by this time and only metribuzin applied at the two highest rates of 1.0 and 0.75 kg (a.i.)/ha (20.0% and 16.3%) resulted in crop injury significantly higher than the control. Injury was in the form of a crop stunting.

In the Sackville trial, 29 days after application, only the two highest rates of metribuzin (0.75 and 1.0 kg(ai)/ha) resulted in injury levels significantly higher than the untreated control (21.2% and 30.0%) (see table 2). By 58 days after application all the metribuzin treatments recovered enough that none of the treatments were significantly higher than the untreated control.

Plant counts were taken June 1 (29 days after application) in the Cornhill trial and July 11 (29 days after application) in the Sackville trial. Plant counts although varying, were not significantly different from one another in either trial (see tables 1 and 2). This indicated that none of the treatments affected germination.

Two types of different yield data were collected from each trial. Lupin bean yield was collected from the Cornhill trial and although yields varied between treatments none were significantly different from one another (see table 1). Crop injury observed from metribuzin treatments therefore did not reduce yields. Differences between metobromuron treatments were not understood.

In Sackville, lupines were planted late (May 26) and as a result were not given a long enough season to fully mature. Plots were therefore harvested as a silage. Weeds were removed from all plots prior to harvest, to compare treatments on a lupin biomass basis. Results indicated that the control resulted in the lowest biomass yield because plant growth had been suppressed by the heavy weed pressure, particularly lamb's quarters. All treatments resulted in a significantly higher biomass yield than the control (see table 2). The low and high rate of metribuzin were the next lowest yielding treatments but were not significantly lower than most of the other treatments.

B) Cornhill-PPI trial

Crop injury rating were difficult on June 1 (29 days after application) since lupin emergence was very slow due to poor growing conditions. Lupines at this time had just emerged through the soil. Injury ratings were therefore taken June 19 (47 days after application) and June 29 (57 days after application). This trial included two rates of trifluralin (ppi), 2 rates of ethalfluralin(ppi), 1 rate of metribuzin and 1 rate of metobromuron. Only the metribuzin treatment resulted in significant crop injury at either date (see table 3). Injury levels were 15% on June 19 and 13.75% on June 29. There were no significant differences between lupin density counts, indicating no effect on lupin germination. Yields were not available due to the unexpected ploughing of the field containing the trial.

WEED CONTROL

A) Cornhill and Sackville PRE trials

Weeds present in the two trials differed. The Cornhill trial had a greater range of weeds , and included more perennials than the Sackville trial. Major weeds present in Cornhill included vetch, daisy, hempnettle, toadflax, goldenrod and lamb's quarters. Major weeds in the Sackville trial included lamb's quarters, chickweed and wild buckwheat with some vetch and shepherds purse also being present. Overall, weed control in the Cornhill trial was terrible due to high number of perennial weeds of which the herbicides were not selective towards. Due to the heavy quackgrasss infestation at both sites, fluazifop-p-butyl was applied over the entire trial and not just treatments were it is listed as a sequential treatment i.e (metrobromuron;fluazifop-p-butyl). Weed control will be discussed on a weed species basis.

Vetch - Although some vetch was significantly controlled in the Cornhill trial as compared to the untreated plots throughout the summer, control levels were still too low and unacceptable. Control levels were never over 20.0% (see table 1).

Hempnettle - Initial significant hempnettle control was observed in the Cornhill pre trial (29 days after application - June 1), but all recovered to levels not significantly different by the June 19 assessment date. Treatments resulting in initial significant hempnettle control (29 days) as compared to the untreated plots included metribuzin 1.0 kg(a.i.)/ha (97.5%), metribuzin(0.5 kg(a.i.)/ha) (90.0%), linuron + fluazifop-p-butyl(82.5%), metribuzin (0.75 kg(a.i.)/ha)(82.5%) and linuron 1.5 kg(a.i.)/ha(77.5%) (see table 1). Although these treatments control varied, they were not significantly different from one another (see table 1).

Daisy, toadflax, goldenrod - Although some slight control was observed on these three perennial weeds in the Cornhill pre trial, none were significantly higher than the control plots at any assessment date. This was expected as the herbicides being evaluated are known to be much more selective towards annual, than perennial weeds.

Lamb's Quarters - Lamb's quarters was present in the Cornhill pre trial but did not start germinating until late in the season. Ratings taken June 29, (57 days after application) indicated that only a few scattered plants were present. By the last rating however (September 11), lamb's quarters was present in most all plots. This indicated that the treatments residual activity had diminished.

In the Sackville trial, lamb's quarters was the predominant weed and partially smothered out plots where it was not controlled. Ratings collected 29 days after application (July 11), indicated that all treatments significantly controlled lamb's quarters as compared to the untreated control. Control levels ranged from 65% to 90%, with treatments providing over 85% control not being significantly different from one another (see table 2). Only two treatments, metribuzin (0.5 kg(a.i.)/ha - (65.0%)) and metobromuron (1.0 kg(a.i.)/ha - (73.8%)), resulted in control levels under 65.0%.

In the Sackville trial, fifty eight days after application (Aug.9) all treatments continued to result in significant lamb's quarters control as compared to the untreated plots. Control levels ranged from 41.3% to 92.5%. Treatments providing over 80% control and not significantly different from one another included metribuzin (0.75 kg(a.i.)/ha)(81.3%); metobromuron + metolachlor (1.6 + 2.4 kg(a.i.)/ha)(83.8%), linuron (1.5 kg(a.i.)/ha)(83.8%), metribuzin (1.0 kg(a.i.)/ha)(85%) and metobromuron 1.5 kg(a.i.)/ha (92.5%).

Chickweed - Chickweed was also present in the Sackville trial but at lower densities than lamb's quarters. Twenty nine days after application all treatments resulted in significant chickweed control as compared to the untreated plots. Control was excellent from all treatments with control ranging from 90 to 100%. Fifty eight days after application (Aug. 9), all treatments continued to significantly control chickweed (see table 2). Control levels ranged from 76.3% to 88.8% and were not significantly different from one another. The two most effective treatments were linuron (1.5 kg(a.i.)/ha)(88.8%) and metobromuron + fluazifop-p-butyl (1.6 +0.25 kg(a.i.)/ha) (88.8%).

Wild buckwheat - Wild buckwheat was also present in the Sackville trial at about the same densities as chickweed. All treatments significantly controlled wild buckwheat as compared to the untreated plots 29 days after application. Control levels ranged from 75.8 to 97.5% and were not significantly different from one another. Fifty eight days after application (Aug.9), all treatments continued to significantly control wild buckwheat as compared to the untreated control(see table 2). Control levels ranged from 78.8 to 91.3% and were not significantly different from one another. The three most effective treatments were metobromuron + fluazifop-p-butyl (1.6+0.25 kg(a.i.)/ha) (91.3%), metobromuron(1.5

kg(a.i.)/ha)(88.8%) and metobromuron + metolachlor (1.6+2.4 kg(a.i.)/ha) (88.8%).

B) Cornhill PPI trial

Weeds present at the trial site included dandelion, barley, alfalfa, chickweed, plantain, hawkweed, daisy and vetch. The herbicides tested were ineffective on these weeds at the rates applied. No significant weed control was observed from any of the treatments at any assessment date. Trifluralin and ethalfluralin are known to be weak on these weeds, and the cool, damp spring would have made these herbicides even less active. Rates of metribuzin and metobromuron were too low and are not known to be very active against the majority of the above weeds.

CONCLUSIONS: Results from all three trials indicated that only metribuzin treatments resulted in injury levels significantly higher than the control at any assessment date. Injured plants recovered faster from the later planted trial in Sackville than the earlier planted Cornhill trials. It is possible that the Cornhill lupins may have been under more stress due the cool and damp spring than lupines planted later in Sackville. As a result the stressed plants may have been slower to recover from the initial injury.

Analysis of lupin density counts and yield data from both trials indicated that lupines were not adversely affected by the metribuzin damage. It is felt that the weed control benefits should offset the injury from metribuzin. Yield data collected from the Cornhill pre trial indicated that there were no significant differences in bean yields. Biomass yields collected from the Sackville trial however, indicated that all treatments increased yields as compared to the control. This could be expected as the weeds present in the control plots smothered the lupins and limited its growth. The high and low rate of metribuzin did however, result in low silage yields as compared to many of the other treatments.

Weed control in the two Cornhill trials was very poor and unacceptable. This was due to the presence of many perennial weeds and the late germination of annual weeds. Metribuzin treatments resulted in the best hempnettle control in the Pre trial, followed by linuron and metobromuron treatments. Differences were not always significant however, and control was short lived.

Lamb's quarters was the predominant weed in the Sackville trial. By Aug. 9 all treatments resulted in significant control as compared to the untreated plots. Control ranged from 41.3 to 92.5% control. The top two treatments were metobromuron 1.5 kg(a.i.)/ha)(92.5%) and metribuzin(1.0 kg(a.i.)/ha) (85.0%). Chickweed and wild buckwheat were controlled at levels over 75% by all treatments included in the trial. Treatments were all significantly higher than the untreated control, but not significantly different from one another.

No weed control was observed from any of the treatments in the Cornhill PPI trial. This could be expected as trifluralin and ethalfluralin are strongest against annual grasses, which were not present in the trial. In addition the pre treatments applied in this trial are known to be weak against the perennial weeds which were present.

Results from the trial indicated that there were no major differences between weed control or crop yields when comparing all the treatments. Although initial injury can be expected from metribuzin, the additional benefits from weed control should offset any injury sustained from the metribuzin treatments. Lupines appear to be very tolerant to all the other treatments.

REFERENCES:

McCully, K.V. 1989. Crop tolerance and weed control in sweet white lupins. 1989 Adaptive Research Report. 11: 134-136.

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Table 1: Cornhill PRE Trial - Crop Damage, Weed Control, Yields and Plant Counts

Treatment	Rate Kg(a.i.) /Ha	CROP DAMAGE June 19 (47 dys)	June 29 (57 dys)	Sept.11 (131 dys)	Average Plant Counts June 1 (29 dys)	Ylds T/ha 16% Moisture	Vetch June 29 (57 dys)	Hempnettle June 1 (29 dys)
Control	-	0c	0c	0c	37.5 NS	.96 NS	0d	40d
Metribuzin	.5	15b	22.5b	7.5bc	32	1.15	12.5abc	90ab
Metribuzin	.75	22.5ab	31.3a	16.3ab	36.75	1.16	16.3ab	82.5abc
Metribuzin	1.0	28.8a	37.5a	20.0a	32.5	1.01	18.8a	97.5a
Linuron	1.0	0c	0c	0c	35.5	1.26	12.5abc	60bcd
Linuron	1.5	0c	0c	0c	36.25	1.17	11.3abc	77.5abc
Metobromuron	1.0	0c	0c	0c	43.5	0.94	6.3cd	67.5 abcd
Metobromuron	1.5	0c	0c	0c	30	.89	0d	55cd
Metobromuron + Metolachlor	1.6 + 2.4	12.5bc	5.0c	1.3c	32.75	1.06	7.5bcd	55cd
Metobromuron + Fluazifop-p-butyl	1.6 + .25	0c	0c	0c	33.75	1.20	1.3d	62.5bcd
Linuron + Fluazifop-p-butyl	1.0 + .25	0c	0c	0c	35	1.34	11.3abc	82.5abc

Fluazifop-p-butyl was applied to all plots within trial and not just to treatments specified
Means with the same letter are not significantly different at the 0.05 level of significnce according to Duncan's Multiple Range Test.

Table 2: Sackville PRE Trial - Crop Damage, Weed Control, Yields and Plant Counts

Treatment	Rate Kg(ai) /Ha	Sackville July 11 (29 dys)	Sackville Aug.9 (58 dys)	Yields T/ha Sept. 18	Average Plant Counts July 11 (29 dys)	L.Q. July 11 (29 dys)	L.Q. Aug. 9 (58 dys)	C.W. Aug. 9 (58 dys)	W.B. Aug.9 (58 dys)
Control	-	0c	0 NS	4.82c	32.3 NS	0.0d	12.5c	0b	0b
Metribuzin	.5	10c	6.25	9.53b	29.2	65.0c	41.3b	81.3a	87.5a
Metribuzin	.75	21.2b	3.75	12.49ab	26.8	90.0a	81.3a	84.3a	83.8a
Metribuzin	1.0	30a	7.5	10.71ab	27.5	87.5a	85.0a	86.3a	85.0a
Linuron	1.0	0c	0	12.41ab	25.8	85.0ab	68.8a	82.5a	85.0a
Linuron	1.5	0c	0	12.67ab	27.3	88.8a	83.8a	88.8a	86.3a
Metobromuron	1.0	2.5c	7.5	10.83ab	26.0	73.8bc	71.3a	83.8a	86.3a
Metobromuron	1.5	0c	0	13.94a	29.5	87.5a	92.5a	86.3a	88.8a
Metobromuron + Metolachlor	1.6 + 2.4	2.5c	1.25	10.79ab	32.3	85.0ab	83.8a	83.8a	88.8a
Metobromuron + Fluazifop-p-butyl	1.6 + .25	0c	0	12.03ab	29.8	87.5a	77.5a	88.8a	91.3a
Linuron + Fluazifop-p-butyl	1.0 + .25	5.0c	0	11.28ab	29.0	87.5a	73.8a	76.3a	78.8a

L.Q.- lamb's quarters; C.W. - chickweed; W.B.- wild buckwheat
Fluazifop-p-butyl was applied to all plots within trial and not just to treatments specified
Means with the same letter are not significantly different at the 0.05 level of significance according to Duncan's multiple range test.

Table 3: Cornhill PPI Trial- Crop Tolerance and Lupin Plant Counts

TREATMENT	TIMING	RATE (kg(a.i.)/Ha)	CROP DAMAGE June 19 (47 dys)	June 29 (57 dys)	Average Plant Counts June 1 (29 dys)
Control	-	-	0b	0b	26NS
Trifluralin	PPI	0.75	0b	0b	37
Trifluralin	PPI	1.0	0b	0b	32
Ethalfluralin	PPI	0.75	0b	0b	36
Ethalfluralin	PPI	1.0	0b	0b	25
Metobromuron	PRE	1.5	0b	0b	32
Metribuzin	PRE	0.5	15a	13.8a	29

Means with the same letter are not significantly different at the 0.05 levels of significance according to Duncan's multiple range test.

BUNCHBERRY CONTROL AT BLUEBERRY TIP DIEBACK

K.V. McCully, D.O. Hanscomb, and M.A. Mann

ABSTRACT: A trial to evaluate bunchberry control and crop tolerance at tip dieback was established at Stewarton, Queen Co., N.B. Pre treatment bunchberry density counts were collected from permanent quadrats and compared to density counts collected the following year. Visual ratings on crop damage and bunchberry control were also collected. Results indicated that none of the treatments resulted in both satisfactory bunchberry control and crop tolerance.

RÉPRESSION DES QUATRE-TEMPS DANS LES BLEUETIÈRES ET RÉSISTANCE DES BLEUETS AU DÉPÉRISSEMENT DE LA POINTE

Résumé: Un essai réalisé à Stewart, comté de Queen (N.-B.), avait pour but d'établir l'efficacité de certains produits contre les quatre-temps et la résistance du bleuet au dépérissement de la pointe. On avait mesuré la densité des quatre-temps dans des quadrats permanents, et on l'a comparée à la densité présente l'année suivante. On a également fait une évaluation visuelle des dommages causés aux bleuets et du taux de répression des quatre- temps. Les résultats obtenus indiquent qu'aucun des traitements appliqués ne s'est révélé satisfaisant en ce qui concerne la répression des quatre-temps et la tolérance des bleuets.

INTRODUCTION: Presently the number one weed problem in commercial lowbush blueberry fields is bunchberry (*Cornus canadensis* L.) (McCully, 1988). As other weeds are being controlled, bunchberry is thriving from the lack of competition. It readily adapts to the management practices associated with blueberry production and is increasing in numbers.

Timing of herbicide application is important. One time that has received little attention is a period in the blueberry life cycle called tip dieback. This stage occurs in the prune year, generally in early August, and results in the dieback of the blueberry tip (Barker + Collins, 1963). It marks the end of the vegetative activity for that year, and may be a time when blueberry plants are less active and possibly more tolerant to herbicides. A trial was therefore established to evaluate various treatments at this time.

MATERIALS AND METHODS: The trial was established at Stewarton, Queen's Co., in a silt loam soil having a pH of 4.9, an organic matter content of 5.7% and a ratio of 40% sand, 59% silt, and 1% clay. Herbicides (see Table 1) were applied August 2, 1989 in a randomized complete block design with four replicates. Plot size was 2m*6m. Treatments were applied to blueberries at the tip dieback stage using a CO_2 backpack sprayer in a water volume of 200L/ha and at a pressure of 200 kPa. Rainfall was 27 mm, 7 days before application and 34 mm ,7 days after. Visual ratings on weed control and crop phytotoxicity were taken August 31, 1989 and May 31, 1990. Bunchberry stem counts were taken in permanent 1 m^2 quadrats August 1, 1989 and September 27, 1990. Yields were taken August 17, 1990. Arcsin transformations were performed on the visual evaluations where necessary, and logarithmic transformations on the density counts and yields. Means were separated by Duncan's multiple range test.

RESULTS AND DISCUSSIONS:

Crop Damage

Plots were sprayed August 2 and evaluated for crop injury August 30. Results indicated that all treatments containing hexazinone were the most phytotoxic (see Table 1). This could be expected since hexazinone is recommended for application to dormant blueberries only. Application at tip dieback is apparently still too active a state for hexazinone application. The hexazinone treatments and the bentazon + assist treatment all caused over 85% injury, but were not significantly different from each other. Only the chlorsulfuron (0.01 kg (a.i.)/ha) treatment was not significantly different from the untreated control.

May 31 of the following year, crop tolerance was once again assessed. Treatments previously displaying no injury symptoms were now severely injured. Metsulfuron methyl treatments all resulted in 100% damage to blueberry plants and the chlorsulfuron + Enhance treatment caused 75% damage. The remaining treatments injury levels were all below 18%. Previously injured plots treated with hexazinone and bentazon + assist had recovered, and were not significantly different from the untreated plots. Reasons for metsulfuron methyl high damage levels were the result of over-application. Rates were applied 10x the suggested amount and damage was not evident until the herbicide had a chance to move into the root zone following winter snow and spring rains. Lower rates would not have caused as much damage.

Evaluation of yields indicated that all treatments caused a reduction in yield as compared to the untreated control. The only treatments not significantly lower were terbacil + hexazinone and hexazinone applied alone. No yields were available from metsulfuron methyl treated plots due to the high damage levels.

Bunchberry Control

Assessment of bunchberry control August 30 of the application year indicated that all treatments significantly controlled bunchberry as compared to the untreated control. Control levels ranged from 6.3% to 52.5% but were considered too low and unacceptable(see Table 1). Only one treatment resulted in over 50% control, terbacil + hexazinone (52.5%).

Later in the fall results changed little. Plots treated with metsulfuron methyl and chlorsulfuron caused bunchberry leaves to turn red and hang on much longer than normal.

On May 31 of the following year, bunchberry control was once again assessed. All treatments except terbacil + hexazinone, bentazon + assist, and hexazinone resulted in significantly higher bunchberry control than the untreated control. The only treatments providing acceptable levels of bunchberry control were metsulfuron methyl (0.2 kg(a.i.)/ha) (99%), metsulfuron methyl + enhance (97.8%), and metsulfuron methyl (0.1 kg(a.i.)/ha) (91.5%). Crop damage levels were,however, much too high with these treatments.

Bunchberry counts were also collected in both years. As expected treatments with the highest visual control ratings had the lowest density counts. Although densities varied between treatments, the only treatments resulting in a decrease in bunchberry densities from year to year and significantly lower than the untreated plots were the three metsulfuron methyl treatments (see Table 1).

CONCLUSIONS:

None of the treatments evaluated resulted in both satisfactory bunchberry control and crop tolerance at tip dieback. Metsulfuron methyl and chlorsulfuron treatments did not display crop damage symptoms or bunchberry control until the following year. Treatments displaying initial injury and bunchberry control symptoms recovered the following year.

REFERENCES

Barker, W.G. and W. B. Collins. 1963. Growth and Development of the Lowbush Blueberry: Apical Abortion. Can. J. Bot. (41): 1319-1324.

McCully, K.V. 1988. Weed Problems in N.S. Blueberry fields. M.Sc. Thesis. Dept. Plant Sci., McGill University, Montreal, pp 209.

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Table 1 - Densities, Yields and Visual Evaluations

Treatment	Rate kg(a.i.) /ha	% CROP DAMAGE		% WEED CONTROL		BUNCHBERRY DENSITIES (m^2)		YIELDS
						(Pre-trt)	(Post-trt)	T/ha
		890830	900531	890830	900531	890801	900926	900817
Control	-	0 c	0 e	0 f	0 e	125 NS	246 a	3.66 a
Hexazinone	2.0	96.3 a	3.8 de	41.3 ab	10 de	82	141 ab	2.13 abc
Hexazinone + Enhance	2.0 + .5	92.5 a	8.8 d	45.0 ab	11.3 d	127	273 a	0.44 de
Atrazine+ Hexazinone	2.5 + 1.25	85.8 a	2.5 e	32.5 bc	13.8 cd	89	192 ab	1.87 bc
Terbacil + Hexazinone	2.5 + 1.25	86.3 a	2.5 e	52.5 a	6.3 de	96	206 a	3.04 ab
Bentazon + Assist	1.1 + 2	85.0 a	1.3 e	13.8 de	7.5 de	101	220 a	1.36 cd
Chlorsulfuron	0.01	7.5 c	3.8 de	6.3 e	15.0 cd	60	178 ab	1.19 cd
Chlorsulfuon + Enhance	0.01 + 0.5	26.3 b	75.0 b	17.5 cd	58.8 b	97	142 ab	0.47 de
Chlorsulfuron	0.015	26.3 b	17.8 c	17.5 cd	22.5 c	79	142 ab	2.00 bc
Metsulfuron methyl	0.1	31.3 b	100 a	28.8 bcd	91.5 a	106	66 b	0.0 e
Metsulfuron methyl + Enhance	0.1+0.5	38.8 b	100 a	38.8 ab	97.8 a	109	8 c	0.0 e
Metsulfuron methyl	0.20	41.3 b	100 a	40.0 ab	99.0 a	96	10 c	0.0 e

means with the same letter are not significantly different at the 0.05 level of significance according to Duncan's multiple range test.

WILD OAT AND BROADLEAF WEED CONTROL IN BARLEY

K. McCully, M. Mann, D. Hanscomb, and Y. Martineau

ABSTRACT: A trial to evaluate various herbicides and mixtures for their effectiveness in controlling wild oats and broadleaf weeds in Leger barley was established. Visual ratings on wild oat control, broadleaf weed control and crop tolerance were collected. Barley height and seed head length measurements were also collected. Fenoxaprop-p-ethyl/MCPA treatments were the most phytotoxic to barley, but as the season progressed the barley recovered. There were no significant differences between barley height or seed head length for any of the treatments, when measured on July 30. Wild oats were controlled at levels over 80% by imazamethabenz (86.2%), ICIA 0604 + DPX R9674 (83.7%) and Imazamethabenz + MCPA (81.2%). Treatments containing DPX R9674 and thifensulfuron resulted in the best broadleaf weed control. Best overall wild oat and broadleaf weed control resulted from diclofop methyl + DPX R9674 and ICIA 0604 + DPX R9674 + S.O.C.

RÉPRESSION DE LA FOLLE AVOINE ET DES MAUVAISES HERBES À LARGES FEUILLES DANS LES CULTURES D'ORGE

Résumé: Un essai a eu lieu pour évaluer l'efficacité de divers herbicides et mélanges contre la folle avoine et les mauvaises herbes à larges feuilles dans les cultures d'orge Léger. On a fait l'évaluation visuelle du taux de répression de la folle avoine et des mauvaises herbes à larges feuilles, en plus de mesurer la tolérance de l'orge, sa hauteur et la longueur de la tige porte-graines. Le produit fénoxaprop d'éthylène/MCPA a été le plus phytotoxique pour l'orge, mais la culture s'est rétablie à mesure que la saison progressait. Les mesures faites le 30 juillet n'ont révélé aucun écart important entre les traitements pour ce qui est de la hauteur de l'orge et de la longueur de la tige porte-graines. La folle avoine a été réprimée dans une proportion de plus de 80 p. 100 par les produits imazaméthabenz (86,2 p. 100), ICIA 0604 + DPX R9674 (83,7 p. 100) et imazaméthabenz + MCPA (81,2 p. 100). Les traitements les plus efficaces contre les mauvaises herbes à larges feuilles ont été le DPX R9674 et le thifensulfuron. Les meilleurs résultats obtenus dans l'ensemble pour la répression de la folle avoine et des mauvaises herbes à larges feuilles ont été obtenus avec le diclofop-méthyl + DPX R9674 et le ICIA 0604 + DPX R9674 + S. O. C.

INTRODUCTION: Wild oats remain one of the most serious weed problems in Western Canada. Virtually every hectare of land planted to cereal and oilseed crops is treated with a wild oat herbicide (Banting 1983). Losses from wild oats, such as yield reduction, cleaning costs, and lowering of grade quality are well recognized. Studies on the effect of different wild oat densities in wheat indicate that two wild oat plants per square foot can cause a yield loss of 15 percent (Banting, 1982). Poor broadleaf and perennial grass weed control can further reduce these yields.

Presently, approximately 3000 acres of grain in the St. Quentin area of Restigouche County are infested. This weed must be prevented from spreading to other areas of New Brunswick and densities must be kept at a manageable and controllable level. A herbicide trial was therefore established to evaluate various registered and non registered products. Herbicides were applied either alone, or in a tank mix with a broadleaf weed herbicide to evaluate their effectiveness in controlling wild oats and broadleaf weeds with no associated crop damage.

This trial is a continuation of trials conducted during the past two years (see 1988 and 1989 Adaptive Research Reports). AC 222, 293 reported in these past reports is now called Imazamethabenz. Hoe 6001-02H in past reports is now called fenoxaprop-p-ethyl/Hoe 070542 in this report. Hoe 046360 in past reports is now called fenoxaprop-p-ethyl. DPX R9674 and thifensulfuron (DPX M6316 or REFINE) were included in this trial for broadleaf weed control.

MATERIALS AND METHODS: Leger barley was planted at a seeding rate of 151 kg/ha and at a row width of 18 cm May 20, 1990 in St. Quentin, Restigouche Co. The soil was a silt loam with a pH of 7.2 and an organic matter content of 4%. 364 kg/ha of 12-24-24 fertilizer was applied. Experimental design was a randomized complete block with four replicates. Plot size was 2m x 6m. Previous crop was barley. Post emergence(POST) herbicides were applied June 6, 1990 at the barley 2-3 leaf stage and wildoat 2-3 leaf stage. Broadleaf weeds were 2 cm high. Herbicides were applied using a CO_2 backpack sprayer in a water volume of 150 L/ha at a pressure of 200 kPa. Rainfall was 8.4 mm, 7 days prior to application and 31 mm, 14 days after. Visual ratings on crop phytotoxicity and weed control were collected June 20, July 5 and July 18. Barley height and seed head length were measured July 30, 1990. Wildoat counts were taken in two randomly tossed 50 cm^2 quadrats July 30. Barley was green chopped due to high wild oat densities on August 1. Yield data was therefore unavailable. Arcsin transformation were performed on the visual evaluations where necessary, and logarithmic transformations were performed on the barley measurements and wild oat counts. Means were separated by Duncan's multiple range test.

RESULTS AND DISCUSSION:

Barley Tolerance

Treatments containing fenoxaprop-p-ethyl/mcpa were the most phytotoxic, followed by fenoxaprop-p-ethyl/Hoe 070542. As the season progressed, less damage was evident. Damage was observed mostly as an initial stunting of plant height and chlorosis. By the final assessment date (July 18) fenoxaprop-p-ethyl/mcpa applied alone and when tankmixed with DPX R9674 resulted in 15% damage. The remaining treatments containing fenoxaprop-p-ethyl resulted in slight damage levels of 5%. No damage was observed from any of the other treatments at this time.

Barley height was measured throughout the rating periods, and although differences existed, none were significant (see Table 1). Barley head length was also measured but no significant differences existed between treatments (see Table 1).

WEED CONTROL

Wild Oats: All treatments significantly controlled wild oats as compared to the untreated plots during all rating periods. By the last rating date (July 18) control ranged from a low of 55% to a high of 86.2% (see table 1). All treatments providing over 66% wild oat control were not significantly different from each other. Treatments resulting in over 80% control included imazamethabenz (86.2%), ICIA 0604 + DPX R9674 (83.7%) and imazamethabenz + MCPA ester (81.2%).

Wild oat density counts were significantly lower than the control for all treatments, but not significantly different from each other (see table 1). Treatments with the lowest counts did not necessarily correspond to the treatments with the highest visual control ratings. Counts were collected from two quarter square metre quadrats, a small percentage of the total plot area. Wild oats could have been present in larger numbers, but if the randomly thrown quadrats missed them the differences between visual ratings and density counts could be exaggerated.

When comparing treatments based on visual control, it was found that imazamethabenz treatments were not significantly different from each other. ICI 0604 + DPX R9674 + S.O.C. was not significantly different from ICI 0604 + S.O.C. but both were significantly better than ICI 0604 + thifensulfuron. This is surprising since DPX R9674 and thifensulfuron are very closely related.

The fenoxaprop-p-ethyl/mcpa treatments were not significantly different from one another. The fenoxaprop-p-ethyl/mcpa treatments provided better wild oat control than the fenoxaprop-p-ethyl + Hoe 070642 (A modifier) + 2,4-D treatments, but not always significantly. The latter treatments were amongst the poorest tested.

The standard treatment used mostly in the St. Quentin area is now diclofop-methyl + thifensulfuron. This treatment was not significantly different from the other treatments containing diclofop methyl. The treatments containing imazamethabenz, ICI 0604 (except when mixed with thifensulfuron) and fenoxaprop-p-ethyl/MCPA (except when mixed with DPX R9674) all resulted in higher levels of wild oat control than the diclofop methyl treatments, but not significantly.

Chickweed: The best treatments throughout the rating dates were the tank mixes containing either DPX R9674 or thifensulfuron. By July 18, these treatments resulted in control levels of between 62.5% and 87.5%, but were not significantly different from one another (See table 1). Treatments resulting in over 80% control included ICIA 0604 + DPX R9674 (87.5%), diclofop methyl + thifensulfuron (87.5%), diclofop methyl + DPX R9674 (85.0%) and fenoxaprop-p-ethyl/Hoe 070542 + 2,4-D + thifensulfuron (82.5%).

Corn Spurrey: The best treatments throughout the rating dates were the tank mixes containing DPX R9674, thifensulfuron or bromoxynil/MCPA. By the last assessment date (July 18), these treatments resulted in control levels of between 60 and 87.5%, and were not significantly different from each other (see Table 1). Treatments resulting in over 80% control included diclofop methyl + thifensulfuron (87.5%), ICIA 0604 + DPX R9674 (83.7%), diclofop methyl + DPX R9674 (82.5%), and fenoxaprop-p-ethyl/Hoe 070542 + 2,4-D + thifensulfuron (82.5%).

Canada Thistle + Perennial Sow Thistle: Although some treatments resulted in significant control of these weeds, control levels were unacceptable. None of the treatments resulted in over 25% control at any assessment date (see Table 1).

Hempnettle: Throughout the assessment dates, treatments containing either thifensulfuron, DPX R9674 or bromoxynil/MCPA resulted in the best control. This was expected since they are broadleaf weed herbicides known to have some activity on hempnettle. By the last rating date (July 18), the above treatments and imazamethabenz + MCPA ester, resulted in significant hempnettle control as compared to the untreated control plots. They were not significantly different from one another however. Treatments resulting in over 85% hempnettle control included diclofop methyl + DPX R9674 (90.0%); diclofop methyl + thifensulfuron (87.5); ICIA 0604 + DPX R9674 + S.O.C. (87.5%); and ICIA 0604 + thifensulfuron + S.O.C. (85.0%).

CONCLUSIONS: Treatments containing fenoxaprop-p-ethyl/MCPA were initially the most phytotoxic but recovered as the season progressed. Measurements on crop height and seed head length indicated no significant differences amongst treatments.

Wild oats were significantly controlled by all treatments, but not always at acceptable levels above the untreated plots. All treatments resulting in over 66% wild oat control were not significantly different from each other. Treatments resulting in over 80% control included imazamethabenz (86.2%), ICIA 0604 + DPX R9674 (83.7%) and imazamethabenz + MCPA ester (81.2%).

Treatments containing the broadleaf weed herbicides DPX R9674 and thifensulfuron provided the best broadleaf weed control when tank mixed with the wild oat herbicides. Best overall wild oat and broadleaf weed control resulted from diclofop methyl + DPX R9674 and ICIA 0604 + DPX R9674 treatments. Further work should be conducted to evaluate the tank mixes. Imazamethabenz + DPX R9674 and/or thifensulfuron should also be tested since imazamethabenz resulted in good wild oat control and DPX R9674 and thifensulfuron resulted in good broadleaf weed control.

REFERENCES:

Banting, J.D., 1983. Growth Habit and Control of Wildoats. Agricultural Research Station, Regina, Canada.

ACKNOWLEDGEMENTS: Appreciation is expressed to Richard Roy for providing land for this trial.Table 1. Visual Evaluations and Density Counts

Table 1. Crop Tolerance, Weed Control, Barley Measurements and Wild Oat Densities

TREATMENT	RATE(kg(a.i.)/ha	% CROP DAMAGE 0718	% W. O. CONTROL 0718	% C.W. 0718	% C.S. 0718	% C.T. 0718	% S.T. 0718	% H.N. 0718	Barley Height cm 0730	Barley Seed Head Length 0730	W.O. Densities Plts/m^2 0730
Control	-	0	0 e	0 h	0 g	0 NS	0 NS	0 g	89.2 NS	6.7 NS	105 a
Fenoxapro-p-ethyl/MCPA	0.1/0.42	15	76.2 abcd	25 defg	30.0 de	6.2	6.2	57.5bcd	90.2	7.5	5 b
Fenoxapro-p-ethyl/MCPA + Thifensulfuron	0.1/0.42 + 0.015	5	78.7 abc	65 abc	63.7 ab	18.7	18.7	72.5 abc	89.7	6.3	4 b
Fenoxapro-p-ethyl/MCPA + DPXR9674	0.1/0.42 + 0.015	15	66.2 abcd	67.5 abc	70.0 ab	8.7	8.7	82.5 ab	84.7	6.7	1 b
Fenoxapro-p-ethyl/Hoe 070542 + 2,4-D Amine + Thifensulfuron	0.1/0.05 + 0.14 + 0.015	5	61.2 bcd	82.5 ab	80.0 c	10.0	10.0	82.5 ab	95.5	7.0	17 b
Fenoxapro-p-ethyl/Hoe 070542 + 2,4-D Amine + DPX R9674	0.1/0.05 + 0.14 + 0.015	5	55.0 d	62.5 abc	60.0 abc	10.0	10.0	65.0 abc	91.5	6.7	27 b
Fenoxapro-p-ethyl/Hoe 070542 + 2,4-D Amine	0.1/0.05 + 0.14	5	57.5 cd	17.5 efg	17.5 def	7.5	7.5	30.0 def	95.5	95.5	27 b
Diclofop-methyl	0.80	0	76.2 abcd	2 gh	2.0 fg	2.0	2.0	2.0 fg	95	6.8	14 b
Diclofop-methyl + Bromoxynil	0.80 + 0.28	0	70.0 abcd	30.0 def	31.2 cde	5.0	7.5	50.0 cde	92.7	6.5	9
Diclofop-methyl + Thifensulfuron	0.80 + 0.015	0	66.2 abcd	87.5 a	87.5 a	6.2	8.7	87.5 ab	87.5	6.3	11 b
Diclofop-methyl + DPX R9674	0.80 + 0.015	0	72.5 abcd	85.0 ab	82.5 a	22.5	17.5	90.0 a	96.7	6.3	5 b
Difenzoquat + Bromoxynil/MCPA	0.75 + 0.56	0	68.7 abcd	50.0 bcd	70.0 ab	10.0	10.0	70.0 abc	92.0	7.1	17 b
Imazamethabenz	0.45	0	86.2 a	24.0 cfg	24.0 def	14.0	2.7	24.0 efg	94.2	6.8	18 b
Imazamethabenz + MCPA	0.45 + 0.56	0	81.2 ab	42.5 cde	45.0 bcd	17.5	17.5	75.0 abc	86.0	6.0	15 b
ICIA 0604 + Thifensulfuron + S.O.C.	0.25 + 0.015 + 1% v/v	0	55.0 d	67.5 abc	75.0 ab	20.0	17.5	85.0 ab	85.5	6.4	11 b
ICIA 0604 + DPX R9674 + S.O.C.	0.25 + 0.015 + 1% v/v	0	83.7 a	87.5 a	83.7 a	12.5	10.0	87.5 ab	98.2	6.6	5 b
ICIA 0604 + S.O.C.	0.25 + 1% v/v	0	78.7 abc	4.0 h	11.5 efg	4.0	4.0	19.0 fg	90.0	6.2	12 b

W.O.=Wild Oats;C.W.=Chickweed;C.S.=Corn Spurry;C.T.=Canada Thistle;S.T.=Perennial Sow Thistle;H.N.=Hempnettle
Means with the same letter are not significantly different at the 0.05 level of significance according to Duncan's multiple range test.

WEED CONTROL IN TURF

K.V. McCully, M.A. Mann and D.O. Hanscomb

ABSTRACT: A trial to evaluate herbicides for their effectiveness on weed control with minimal crop damage was established in turf. 2,4-D/mecoprop/dicamba, clopyralid/triclopyr and isoxaben, applied either alone, in preformulated mixes, or in tank mixes, were evaluated at various rates and concentrations. Visual evaluations on turf tolerance and weed species were collected. No significant turf damage was observed from any of the herbicides throughout the rating periods. Although not always significantly different from other treatments, treatments containing 2,4-D/mecoprop/dicamba resulted in the best hawkweed, dandelion and fall dandelion control. No significant differences resulted between the two 2,4-D/mecoprop/dicamba concentrations applied at 1.7 kg(a.i.)/ha or the two clopyralid/triclopyr concentrations at 0.828 kg(a.i)/ha. The 90/270 g/L concentration of clopyralid/triclopyr applied at 0.72 kg(a.i.)/ha was more effective than the 15/45 g/L concentration for weed control. The 0.828 kg(a.i.)/ha rate of clopyralid/triclopyr was more effective in controlling hawkweed, dandelion and fall dandelion, than the 0.72 kg(a.i.)/ha rate, but the differences were not always significant. Weed control from all treatments decreased after 42 days.

LA SUPPRESSION DES MAUVAISES HERBES DANS LES CULTURES DE GAZON

Résumé: Un essai a permis d'évaluer l'efficacité de divers herbicides pour la suppression des mauvaises herbes dans les cultures de gazon. On a évalué à différents taux et concentrations les herbicides 2,4-D/mecoprop/dicamba, clopyralid/triclopyr et isoxaben appliqués seuls, en mélanges préformulés ou en mélanges effectués dans un pulvérisateur. Des évaluations visuelles de la tolérance des plantes et de certaines espèces de mauvaises herbes ont été réalisées. Aucun dommage n'a été observé sur les peuplements de gazon durant la période où les observations ont été effectuées. Bien qu'ils ne soient pas considérablement différents des autres traitements, les traitements renfermant du 2,4-D/mecoprop/dicamba ont démontré une efficacité générale supérieure pour l'épervière, le pissenlit et le léontondon automnal. On n'a enregistré aucun écart important entre les deux concentrations 2,4-D/mecoprop/dicamba appliquées à 1,7 kg (i.a.)/ha et les deux concentrations clopyralid/triclopyr appliquées à 0,828 kg (i.a.)/ha. La concentration 90/270 g/L de clopyralid/triclopyr appliquée à 0,72 kg (i.a.)/ha a été plus efficace que la concentration 15/45 g/L pour la suppression des mauvaises herbes. Le clopyralid/triclopyr appliqué au taux de 0,828 kg (i.a.)/ha a été plus efficace pour l'épervière, le pissenlit et le léontondon automnal que le clopyralid/triclopyr appliqué au taux de 0,72 kg (i.a.)/ha, mais la différence d'efficacité entre les deux n'était pas toujours considérable. Après 42 jours, la suppression des mauvaises herbes a diminué pour tous les traitements.

INTRODUCTION:

The herbicide 2,4-D has been the answer to many problems connected with the maintenance of a neat, weed free lawn. It is inexpensive, readily available, easy to apply, and will control many of the common weed species. It is used to control many of the weeds in everything from lawns to cereal fields. About 3600 metric tonnes of 2,4-D are used in Canada each year. This represents about 25% of total herbicide use.

In 1980 it was discovered that 2,4-D products may contain dioxin contaminants. This prompted Agriculture Canada to re-evaluate 2,4-D. Most experts conclude that 2,4-D does not pose a substantial risk when properly used according to label directions. Agriculture Canada's present approach is to allow the continued judicious use of 2,4-D.

The possibility that further restrictions may be imposed on 2,4-D weighs heavily on the turf industry. A trial was therefore established to evaluate alternative herbicides and mixtures to the most commonly used 2,4-D mixture, Killex (2,4-D/mecoprop/dicamba).

MATERIALS AND METHODS:

A trial was established in a mature turf stand in Fredericton, York Co. Soil type was a silt loam with a pH of 5.2. Experimental size was 2m x 2m. Post emergence (Post) herbicides (see table 1, 2, & 3) were applied to actively growing turf June 26, 1990. Treatments 6,7, and 14 were applied as a mist from spray bottles containing 2.5 ml/L, 4.0 ml/L and 2.98 ml/L active ingredient respectively. All other treatments were applied using a CO_2 backpack sprayer in a water volume of 500 L/ha at a pressure of 200 kPa. Rainfall was 32 mm seven days prior to application and 11 mm fourteen days after. Visual assessments on crop phytotoxicity and weed control were collected June 29 (crop phytotoxicity only), July 3, July 10, July 24, August 7 and August 23. Analysis of variance and arcsin transformations were performed on the visual evaluations where necessary and means were separated by Duncan's multiple range test.

RESULTS AND DISCUSSION:

No significant turf damage was observed from any of the treatments throughout the rating period.

Hawkweed was the predominant weed in the plots followed by dandelion and fall dandelion. Weed control will be discussed on a per weed species basis.

Hawkweed

Seven days after application there were no significant differences between treatments and the control plots, indicating that the herbicides had not had time to react (see table 1). Fourteen days after application, all treatments, except isoxaben applied alone at 0.1 and 0.15 kg (a.i.)/ha), significantly injured hawkweed as compared to the untreated control. Injury levels were low however, as none of the treatments resulted in over 50% injury. Clopyralid/ triclopyr treatments applied at both 0.72 and 0.828 kg(a.i.)/ha rates at this time were not significantly different from any of the treatments containing 2,4-D/mecoprop/dicamba applied at 1.7 kg(a.i.)/ha.

Twenty-eight and forty-two days after applications, all treatments, except isoxaben (0.1 and 0.15 kg(a.i.)/ha), continued to control hawkweed significantly higher than the untreated control. Excluding the mist application, the 2,4-D/mecoprop/dicamba formulations resulted in significantly higher hawkweed control than the clopyralid/triclopyr formulations. Control levels were too low however, as none of the treatments resulted in over 55% control.

Isoxaben, applied alone at 0.1 and 0.15 kg(a.i.)/ha, resulted in 0% hawkweed control throughout the rating periods. Isoxaben is a pre-emergence herbicide which should be applied early in the spring to be effective. Applications in this trial were later than recommended. Control from the isoxaben + 2,4-D/mecoprop/dicamba treatment therefore resulted from the 2,4-D/mecoprop/dicamba component.

There were no significant differences between the two concentrations of clopyralid/triclopyr applied at the 0.828 kg(a.i.)/ha rate. There were also no significant differences between the two concentrations of clopyralid/triclopyr applied at the 0.72 kg(a.i.)/ha rates except at the forty-two day rating. At this time the 15/45 g/L concentration resulted in significantly lower hawkweed control than the 90/270 g/L clopyralid/triclopyr active ingredient concentration (see table 1).

Overall, the higher clopyralid/triclopyr rate of 0.828 kg(a.i.)/ha resulted in higher levels of hawkweed control than the 0.72 kg(a.i.)/ha rate. Differences were not always significant however.

Although the 2,4-D/mecoprop/dicamba mist application resulted in higher hawkweed control than the clopyralid/triclopyr mist applications, differences were not significant. Mist applications resulted in less than 27% hawkweed control for all rating periods. Mist treatments may have been more effective if applied earlier, however.

Throughout the rating periods, there were no significant differences between the two concentrations (95/50/9 g/L and 190/100/18 g/L) of 2,4-D/mecoprop/dicamba applied at the 1.7 kg(.a.i.)/ha rate (see table 1).

After forty-two days, hawkweed control generally decreased from all treatments, but 2,4-D/mecoprop/dicamba continued to be best overall treatment.

Dandelion:

Seven days after application there were no significant differences between treatments and the untreated control (see table 2). Fourteen days after application, all treatments, except isoxaben, applied alone at 0.1 and 0.15 kg(a.i.)/ha, and clopyralid/triclopyr applied as a mist (2.5 ml/L), significantly injured dandelion as compared to the untreated control. At this time 2,4-D/mecoprop /dicamba treatments were better than the clopyralid/triclopyr treatments, but differences were not always significant (see table 2).

Twenty-eight and forty-two days after application, all treatments except isoxaben, applied alone at 0.1 and 0.15 kg(.a.i.)/ha, and clopyralid/triclopyr applied either as a mist, or in a 15/45 g/L concentration (0.72 kg(a.i.)/ha), continued to control dandelion significantly higher than the untreated control. Treatments resulting in over 70% control at both assessment dates included: clopyralid/triclopyr 17.25/51.75 g/L (0.828 kg(a.i.)/ha), 2,4-D/mecoprop/dicamba at both 95/50/9 g/L and 190/100/18 g/L concentrations (1.7 kg(a.i.)/ha), 2,4-D/mecoprop/dicamba mist formulation (2.98 ml/L), and isoxaben + 2,4-D/mecoprop/dicamba(0.1 + 1.7 kg(a.i.)/ha). These treatments were not significantly different from each other, however (see table 2).

Twenty-eight and forty-two days after application, there were no significant differences between the two concentrations of clopyralid/triclopyr applied at the 0.828 kg(a.i.)/ha rate. There were however, significant differences between the two concentrations of clopyralid/triclopyr applied at the 0.72 kg(a.i.)/ha rates for both rating periods. At this time the 15/45 g/L concentration resulted in significantly lower dandelion control than the 90/270 g/L clopyralid/triclopyr active ingredient concentration (see table 2).

Throughout the rating periods, the clopyralid/triclopyr mist formulations (2.5 ml/L and 4 ml/L) were not significantly different from the untreated control plots. The 2,4-D/mecoprop/dicamba mist formulation (2.98 ml/L), after twenty-eight and forty two days, resulted in over 70% dandelion control.

Isoxaben, applied alone at 0.1 and 0.15 kg (a.i.)/ha resulted in 0% dandelion control throughout the rating periods. This was expected since isoxaben is a pre-emergence herbicide which should be applied early in the spring to be effective. Control from the isoxaben + 2,4-D/mecoprop/dicamba treatment therefore resulted from the 2,4-D/mecoprop/dicamba component.

Although not always significantly higher, treatments containing 2,4-D/mecoprop/dicamba resulted in higher levels of dandelion control, than the clopyralid/triclopyr treatments. There were no significant differences between the two concentrations of 2,4-D/mecoprop/dicamba when compared at equivalent rates, throughout the rating periods.

Overall, the higher clopyralid/triclopyr rate of 0.828 kg(a.i.)/ha resulted in higher levels of dandelion control than the 0.72 kg(a.i.)/ha rate. Differences were not always significant however.

After forty-two days, dandelion control generally decreased from all treatments, but 2,4-D/mecoprop/dicamba continued to be best overall treatment.

FALL DANDELION

Seven days after application, there were no significant differences between treatments and the control (see table 3). Fourteen days after application, all treatments, except isoxaben, applied alone at 0.1 and 0.15 kg(a.i.)/ha, and the clopyralid/triclopyr mist (2.5 ml/L), significantly injured fall dandelion as compared to the untreated control. At this time, 2,4-D/mecoprop/dicamba treatments resulted in higher levels of fall dandelion control than the clopyralid/triclopyr treatments, but not always significantly.

Twenty-eight and forty-two days after application, all treatments, except isoxaben, applied alone at 0.1 and 0.15 kg(a.i.)/ha, clopyralid/triclopyr applied as a mist (2.5 and 4.0 ml/L), and clopyralid/triclopyr (15/45 g/L) applied at 0.72 kg (a.i.)/ha, continued to control dandelion significantly higher than the untreated control. Treatments resulting in over 70% control at both assessment dates included only the treatments containing 2,4-D or 2,4-D/mecoprop/dicamba. There were no significant differences between the two concentrations (95/50/9 and 190/100/18 g/L) of 2,4-D/mecoprop/dicamba applied at the rate of 1.7 kg(a.i.)/ha (see table 3).

Twenty-eight and forty-two days after application, there were no significant differences between the two concentrations of clopyralid/triclopyr applied at the 0.828 kg(a.i.)/ha rates for either rating period. There were however, significant differences between the two concentrations of clopyralid/triclopyr applied at the 0.72 kg(a.i.)/ha rates for both rating periods. At this time the 15/45 g/L concentration resulted in significantly lower fall dandelion control than the 90/270 g/L clopyralid/triclopyr active ingredient concentration (see table 3).

Overall, the higher clopyralid/triclopyr rate of 0.828 kg(a.i.)/ha resulted in higher levels of fall dandelion control than the 0.72 kg(a.i.)/ha rate. Differences were not always significant however.

After twenty-eight and forty-two days, the 2,4-D/mecoprop/dicamba mist formulations resulted in significantly higher fall dandelion control than the clopyralid/triclopyr mist formulations and the untreated control. For both rating periods, the 2,4-D/mecoprop/dicamba mist formulation resulted in over 70% fall dandelion control while the clopyralid/triclopyr mist applications were not significantly different from the untreated control (see table 3).

Isoxaben, applied alone at 0.1 and 0.15 kg(a.i.)/ha, resulted in 0% fall dandelion control throughout the rating periods. This was expected since isoxaben is a pre-emergence herbicide which should be applied early in the spring to be effective. Control from the isoxaben + 2,4-D/mecoprop/dicamba treatments therefore resulted from the 2,4-D/mecoprop/dicamba component.

After forty-two days, fall dandelion control generally decreased from all treatments, but 2,4-D/mecoprop/dicamba continued to be best overall treatment.

Conclusions:

The turf was very tolerant to all treatments tested as no significant damage was observed from any treatment throughout the rating periods. Treatments containing 2,4-D/mecoprop/dicamba resulted in the best overall weed control. The 2,4-D/mecoprop/dicamba (Killex) treatment was generally more effective in controlling hawkweed, dandelion and fall dandelion than the clopyralid/triclopyr treatment, however differences were not always significant. The low concentration of 2,4-D/mecoprop/dicamba (95/50/9 g/L), in most rating categories, was more effective than the high concentration (190/100/18 g/L), but differences were not significant.

In general, the 0.828 kg(a.i.)/ha rate of clopyralid/triclopyr was more effective, in controlling hawkweed, dandelion and fall dandelion, than the 0.72 kg(a.i.)/ha rate, but differences were not always significant. After 28 days, the 90/270 g/L concentration of clopyralid/triclopyr was significantly more effective in controlling hawkweed, dandelion and fall dandelion than the 15/45 g/L concentration applied at the equivalent rate of 0.72 kg(a.i)/ha.

The mist formulations generally resulted in significantly less hawkweed, dandelion and fall dandelion control than the non mist treatments. The 2,4-D/mecoprop/dicamba mist formulation provided higher hawkweed, dandelion and fall dandelion control than the clopyralid/triclopyr mist formulations, however differences were not always significant. Overall, the mist formulations resulted in poor weed control as compared to the non mist treatments.

Isoxaben applied alone, at 0.1 and 0.15 kg(a.i.)/ha, provided 0% hawkweed, dandelion and fall dandelion control. Isoxaben is a pre-emergence herbicide which should be applied in early spring to be effective. Applications in this trial were later than recommended. Control from the isoxaben + 2,4-D/mecoprop/dicamba treatments therefore resulted from the 2,4-D/mecoprop/dicamba component.

After forty-two days, weed control generally decreased from all treatments, but 2,4-D/mecoprop/dicamba continued to be the best overall treatment.

It is possible that higher levels of weed control may have resulted if treatments had been applied at an earlier date. Weeds would be more mature and more difficult to control as the season progressed. Hawkweed control levels for example, may have been higher if treatments were applied earlier, before leaf hairs had time to fully develop.

Table 1 - Hawkweed Control

TREATMENT	Rate Kg(ai)/ha	A.I. g/L	WEED CONTROL (days after application) 7	14	28	42
Control	-	-	0 NS	0 c	0 e	0 f
Clopyralid/Triclopyr	0.72	90/270	28.75	40.0 a	31.25 bc	33.75 bc
Clopyralid/Triclopyr	0.828	90/270	23.75	46.25 a	33.75 b	36.25 b
Clopyralid/Triclopyr	0.72	15/45	25.0	42.5 a	18.75 cd	17.5 de
Clopyralid/Triclopyr	0.828	17.25/51.75	25.0	45.0 a	28.75 bc	30.0 bcd
Clopyralid/Triclopyr	mist	2.5mL/L	13.75	22.5 b	18.75 cd	20.0 de
Clopyralid/Triclopyr	mist	4 mL/L	25.0	25.0 b	15 d	16.25 e
Isoxaben	0.1	750	5.0	0 c	0 e	0 f
Isoxaben+ 2,4-D/Mecoprop/Dicamba	0.1+1.7	750 + 95/50/9	17.5	42.5 a	53.75 a	54.25 a
Isoxaben	0.15	750	8.75	2.5 c	0 e	0 f
2,4-D/Mecoprop/Dicamba	1.7	190/100/18	26.25	42.5 a	55.0 a	52.50 a
2,4-D + Isoxaben	1.1+0.1	500+750	8.75	23.75 b	18.75 cd	22.5 cde
2,4-D/Mecoprop/Dicamba	1.7	95/50/9	27.5	33.75 ab	51.25 a	51.25 a
2,4-D/Mecoprop/Dicamba	mist	2.98 mL/L	10.0	22.5 b	26.25 bcd	26.25 bcde

Means with the same letter are not significantly different at the 0.05 level of significance according to Duncan's multiple range test

Table 2 - Dandelion Control

TREATMENT	Rate Kg(ai)/ha	A.I. g/L	WEED CONTROL (days after application)			
			7	14	28	42
Control	-	-	0 NS	0 e	0 d	0 e
Clopyralid/Triclopyr	0.72	90/270	28.75	38.75 abc	43.75 c	43.75 d
Clopyralid/Triclopyr	0.828	90/270	27.5	32.5 abcd	61.25 bc	62.0 cd
Clopyralid/Triclopyr	0.72	15/45	15.0	28.75 bcd	15.0 d	15.0 e
Clopyralid/Triclopyr	0.828	17.25/51.75	35.75	45.0 abc	72.5 ab	75.0 abc
Clopyralid/Triclopyr	mist	2.5 mL/L	15.0	16.25 de	0 d	0 e
Clopyralid/Triclopyr	mist	4 mL/L	27.5	23.75 cd	8.75 d	8.75 e
Isoxaben	0.1	750	2.5	2.5 e	0 d	0 e
Isoxaben+ 2,4-D/Mecoprop/Dicamba	0.1+1.7	750+ 95/50/9	21.25	52.5 a	86.25 a	85.75 abc
Isoxaben	0.15	750	6.25	1.25 e	0 d	0 e
2,4-D/Mecoprop/Dicamba	1.7	190/100/18	31.25	43.75 abc	91.25 a	91.25 a
2,4-D + Isoxaben	1.1+0.1	500+750	5.0	26.25 cd	66.25 abc	66.75 bc
2,4-D/Mecoprop/Dicamba	1.7	95/50/9	31.25	48.75 ab	88.75 a	90.0 ab
2,4-D/Mecoprop/Dicamba	mist	2.98 mL/L	13.75	27.5 bcd	71.25 ab	72.5 abc

Means with the same letter are not significantly different at the 0.05 level of significance according to Duncan's multiple range test

Table 3 - FALL DANDELION CONTROL

TREATMENT	Rate Kg(ai)/ha	A.I. g/L	WEED CONTROL (days after application) 7	14	28	42
Control	-	-	0 NS	0 e	0 e	0 d
Clopyralid/Triclopyr	0.72	90/270	28.75	42.5 abc	46.25 d	44.5 c
Clopyralid/Triclopyr	0.828	90/270	22.5	35.0 abcd	53.75 cd	50.0 bc
Clopyralid/Triclopyr	0.72	15/45	21.25	41.25 abc	17.5 e	17.5 d
Clopyralid/Triclopyr	0.828	17.25/51.75	37.5	48.75 ab	65.0 bcd	68.75 ab
Clopyralid/Triclopyr	mist	2.5 mL/L	17.5	15 de	0 e	0 d
Clopyralid/Triclopyr	mist	4 mL/L	26.25	25 cd	3.75 e	3.75 d
Isoxaben	0.1	750	5	0 e	o e	0 d
Isoxaben+ 2,4-D/Mecoprop/Dicamba	0.1+1.7	750+ 95/50/9	21.25	57.5 a	87.5 ab	87.5 a
Isoxaben	0.15	750	6.25	1.25 e	0 e	0 d
2,4-D/Mecoprop/Dicamba	1.7	190/100/18	41.25	51.25 ab	92.5 a	91.5 a
2,4-D + Isoxaben	1.1+0.1	500+750	8.75	35.0 abcd	72.5 abc	70.0 ab
2,4-D/Mecoprop/Dicam	1.7	95/50/9	40.0	52.5 a	96.25 a	93.75 a
2,4-D/Mecoprop/Dicamba	mist	2.98 mL/L	15.0	28.75 bcd	72.5 abc	70.0 ab

Means with the same letter are not significantly different at the 0.05 level of significance according to Duncan's multiple range test

POTATOES - POMMES DE TERRE

EFFECT OF DIFFERENT RATES OF GYPSUM ON YIELD AND SCAB INCIDENCE IN THE POTATO CULTIVAR SHEPODY

R.P.Hinds and A.F. Perley

ABSTRACT: Shepody potato cultivar (scab-susceptible) was planted on the Holmesville soil series (pH 6.1), naturally infested with common scab (Streptomyces scabies). Plots were top-dressed post-planting, with 0, 672, 1344 and 2016 kg/ha of gypsum in a RCBD. Gypsum treatments had no significant effect on total yield or scab incidence in this year's work, though all the gypsum plots produced slightly higher total yields of tubers with little or no scab than the control. Previous work showed 672 kg/ha was best for yields and scab reduction. Scab incidence was very low, in general, in Shepody grown this year.

Like in previous work, gypsum treatments had no significant effect upon specific gravity, french fry color, sucrose content, hollow heart, stem-end browning, tuber periderm %Ca or leaflet %Ca in Shepody. After two years work, gypsum at the rate of 672-1344 kg/ha would appear to offer the best yields and scab reduction in cultivars like Shepody and Kennebec.

EFFETS DE DIFFÉRENTS TAUX DE GYPSE SUR LE RENDEMENT ET SUR LA SENSIBILITÉ À LA GALE DU CULTIVAR DE POMME DE TERRE SHEPODY

Résumé: Un cultivar de pomme de terre Shepody sensible à la gale a été planté dans des sols de type Holmesville (pH de 6,1) naturellement infestés par la gale commune (Streptomyces scabies). Après la plantation, on a épandu du gypse sur les parcelles d'essai d'un dispositif expérimental en bloc divisé au hasard à raison de 0, 672, 1 344 et 2 016 kg par hectare. L'application de gypse n'a eu aucun effet important cette année sur le rendement total ou sur la sensibilité à la gale, même si la gale était complètement absente, ou presque, et que le rendement total de tubercules était un peu plus élevé dans la parcelle traitée au gypse par rapport à la parcelle témoin. Les travaux précédents avaient indiqué que l'application de 672 kg par hectare était celle qui donnait les meilleurs rendements et qui réduisait le plus les taux de gale. En général, les taux de gale étaient très bas dans le cultivar Shepody soumis à l'essai cette année.

INTRODUCTION: Common scab caused by a gram positive filamentous bacterium **Streptomyces scabies** is a ubiquitous, well adapted soil inhabitant, that reduces the quality of yield in susceptible potato cultivars. Anderson and Lorang (1988) reported that the disease can be minimized by crop rotations, irrigation, incorporation of green manures, the addition of sulphur in the form of gypsum or sulphur dust or by pentachloronitrobenzine (PCNB). Davis et al. (1976) hypothesized that the effects of various control measures which reduced scab could be explained by the resulting increase in Ca level of the potato plant but this has yet to be verified. Davis et al. (1974) demonstrated that both elemental S and gypsum reduced scab and soil pH when applied to soil, which had a pH of 7.7. However, they indicated that the reduction in soil pH was not sufficient to account for disease suppression. Ca levels in the tuber peelings were found to be lower than in the untreated plots, suggesting that the reduction of the disease was indirect and due to a decrease in Ca in the tuber peelings. Davis et al. (1976), subsequently indicated that the concentration of Ca in the tuber periderm may be positively correlated with susceptibility to scab. These workers also noted that low soil moisture which increases scab, also resulted in higher Ca concentrations in tuber peelings. Kelman et al. (1989) reported that raising tuber Ca concentration reduces bacterial soft rot susceptibility in potatoes. It was reported by other workers, that pre-plant strip application of sieved $CaSO_4$, was one of the best Ca sources for improving tuber grade and quality. Kelman et al. (1989) reported normal Ca in tuber periderm ranges from 0.057-0.277%. Simmons and Kelling (1987) found that on low Ca tested soils, gypsum did not affect total potato yield, but increased tuber grade and quality at rates of up to 1500 lbs. gypsum/Ac (300 kg Ca/ha). These improvements were accompanied by increased tuber periderm Ca concentrations, even though leaflet Ca concentrations were unaffected. On high Ca tested soils, responses were inconsistent, and tuber periderm Ca was generally not increased. Kelman et al. (1989) reported that tuber Ca concentration is strongly influenced by Ca concentrations in the hill surrounding the tuber as it develops, and direct movement of Ca into the tuber takes place from the soil either directly through the periderm, or through the stolon and tuber roots. It was found that sieved $CaSO_4$ applied (1500 lbs/ac) either broadcast, in a preplant strip or as a side-dress, were effective in increasing Ca concentration in the tuber. Consequent upon the foregoing, it was decided to examine the effects of gypsum ($CaSO_4 . 2H_2O$) applied top-dressed post-planting, upon scab incidence, yield and tuber periderm Ca concentration in Shepody, a scab susceptible potato cultivar, over a three year period.

METHOD: Plots on the Holmesville clay loam soil series with a 10-year history of scab were identified for the purpose of this three year study. The soil tested medium for Ca-levels (1200-2000 kg/ha) under NB Standards. Shepody (cut-seed) was planted on May 20 at 25 cm intro-row spacing. gypsum was applied top-dressed at the rate of 0, 672, 1344 and 2016 kg/ha. Cultivations and hilling allowed the gypsum to remain in the hill where the tubers were to develop. An RCBD was employed. Soil analyses were taken prior to and 8 weeks post planting - latter being during the period of initiation and early tuber development. Plot size was $55.8m^2$. Gypsum used was 22% Ca and 16% S. Tuber periderm was removed with a carrot peeler for analysis.

The first three weeks of July were dry during tuber initiation and early development. Conditions were conducive to scab development. Scab was determined as per key in the Can. Plant Dis. Surv. 51: 1971.

The crop was harvested on September 18, 1990.

RESULTS AND DISCUSSION: Soil Analyses: Mean soil analyses results for the gypsum treatments are given in Table 1. Hinds and Ghanem (1983) found that pH had little effect on scab incidence as infection occurred at low, medium and high pH ranges. In this work, it was decided to examine the effects of gypsum on soils with the initial pH around 6.0 with medium Ca soil levels for the second year in a row. Table 1 shows that after 8 weeks, all the gypsum plots showed an increase in Ca levels with pH near 7.0. These combined with a dry July at the time of tuber initiation should have created the right conditions for scab development in soils known to predispose to the disease.

TABLE 1: Mean Soil Analyses at Four Levels of Gypsum on Shepody Potato Cultivar - 8 Weeks Post-Planting.

		Soil Analyses				
			kg/ha			
Treatment	pH	% O.M.	P_2O_5	K_2O	Ca	Mg
1. 0 kg/ha gypsum	6.6	3.7	210	272	2283	123
2. 672 kg/ha gypsum	7.5	2.9	307	363	3431	94
3. 1344 kg/ha gypsum	7.0	3.7	215	252	3051	162
4. 2016 kg/ha gypsum	7.2	3.3	235	235	3505	109

YIELD: The different gypsum rates did not produce any significant differences in total yield or the various yield sizes. The best total yield was however, produced by 1344 kg/ha gypsum. Last year 672 kg/ha gypsum was significantly better than the control (Hinds and Perley, 1989).

Scab Incidence and Tuber Periderm %Ca: Table 3 shows data on scab incidence and tuber periderm %Ca in Shepody, as affected by four levels of gypsum. All the gypsum plots produced a slightly higher yield of potatoes with little or no scab than the control, but there were no significant differences between the treatments in relation to scab, tuber %Ca or leaflet %Ca. Last year (Hinds and Perley, 1989), similar work on Shepody showed that 672 kg/ha gypsum produced a significantly higher yield of tubers with little or no scab compared to the control. Simmons and Kelling (1987) reported that in higher soil test Ca soils, similar to the one in this trial, responses to gypsum were inconsistent and periderm %Ca concentration was generally not increased. Also leaflet %Ca was unaffected by gypsum treatments. The results here are quite similar to those reported by Simmons and Kelling. In general, scab incidence was very low this year with susceptible cultivars.

TABLE 2: Yield of Shepody as Affected by Four Levels of Gypsum.

	Yield t/ha			
Treatment	<30m	30-60mm	>60mm	Total
1. 0 kg/ha gypsum	0.25	16.46	15.45	32.16
2. 672 kg/ha gypsum	0.35	15.85	16.66	32.86
3. 1344 kg/ha gypsum	0.40	15.24	18.69	34.33
4. 2016 kg/ha gypsum	0.70	15.44	17.68	33.82

(Treatment Means - not significant at 0.05 level).

TABLE 3: Scab Incidence, Tuber Periderm %Ca and Leaf %Ca in Shepody as Affected by Four Levels of Gypsum.

			Yield t/ha	
			% Tuber - Scab Lesions	
Treatment	Leaflet % Ca	Tuber Periderm %Ca	0-10%	>10%*
1. 0 kg/ha gypsum	0.95	0.12	32.10	0.06
2. 672 kg/ha gypsum	0.85	0.13	32.86	0.00
3. 1344 kg/ha gypsum	0.93	0.11	34.33	0.00
4. 2016 kg/ha gypsum	1.01	0.13	33.82	0.00

(Treatment Means - not significant at 0.05 level).
* Not acceptable by Trade.

Hollow Heart and Stem-End Browning: Neither hollow heart nor stem-end browning were affected by gypsum application. This was similar to what was found last year where hollow heart was nil and stem-end browning was negligible.

Specific Gravity, French Fry Color and Sucrose Content: Gypsum treatments had no significant effect upon specific gravity, french fry color or sucrose content of Shepody (Table 4). These results are similar to what was reported last year (Hinds and Perley, 1989).

TABLE 4: Tuber Specific Gravity, French Fry Color and Sucrose content of Shepody as Affected by Four Levels of Gypsum.

Treatment	Mean Specific Gravity	Mean French Fry Color*	Mean Sucrose Content mg/g
1. 0 kg/ha gypsum	1.068	1.3	1.27
2. 672 kg/ha gypsum	1.073	1.3	1.02
3. 1344 kg/ha gypsum	1.069	1.5	1.51
4. 2016 kg/ha gypsum	1.071	3.0	1.14

(Treatment Means - not significant at 0.05 level).
* USDA equivalent (0-4) is acceptable by Trade.

CONCLUSIONS: Gypsum treatments had no significant effect upon total yield, the various yield sizes, scab incidence, specific gravity, french fry color, sucrose content, hollow heart or stem-end browning. Previous work suggested that the 672 kg/ha produced significantly better total yields and less scab incidence. However, like previous work, all the gypsum treatments produced a slightly better total yield of tubers with little or no scab than the control. Tuber periderm %Ca and leaflet %Ca were also unaffected significantly by the gypsum treatments. The latter seems to be the case for soils which test high in Ca. After two years work, gypsum applications between 672-1344 kg/ha would appear to be best for total yield and scab reduction in susceptible cultivars like Shepody and Kennebec.

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REFERENCES:

1. Anderson, N.A., and J.M. Lorang, 1988. Potato Scab: An old disease presents new control opportunities. Valley Potato Grower. December, 1988. p. 14.

2. Davis, J.R., McDole, R.E., and R.M. Callihan. 1976. Fertilizer effects on common scab of potato and the relation of calcium and phosphate - phosphorus. Phytopathology 66: 1236 - 1241.

3. Davis, J.R., Garner, J.G., and R.M. Callihan. 1974. Effects of Gypsum, Sulphur, Temaclor, and Terraclor Super-X for Potato Scab Control. Am. Pot. J. 51: 35-43.

4. Hinds, R.P., and I. Ghanem, 1983. Limestone and gypsum applications on potatoes. Pot. Dev. Dir. Div. NBDA.

5. Hinds, R.P., and A. Perley, 1989. Effect of gypsum on yield and scab incidence in the potato cultivar Shepody. Ad. Res. Rep. P.I.B. NBDA.

6. Kellman, A., McGuire, R.G., and K.C. Tzeng. 1989 in Management of Diseases by Micro and Macroelements, Engelhard, A.W. ed. pp 102-123.

7. Simmons, K.F., and K.A. Kelling. 1987. Potato Responses to Calcium Application on Several Soil types. Am. Pot. J. 64: 119-136.

RESPONSE OF RUSSET BURBANK POTATO CULTIVAR TO DIFFERENT CALCIUM TREATMENTS

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ABSTRACT: Different calcium carriers were applied to Russet Burbank potato cultivar on the Holmesville soil series to examine their effects upon yield, tuber quality and tuber periderm %Ca. The treatments were N-hib Ca in a split application (75 kg/ha N + 33 kg/ha Ca); Calcium nitrate 224 kg/ha (43 kg/ha Ca + 35 kg/ha N); gypsum 672 kg/ha (147 kg/ha Ca); Cal-U-Sol 168 kg/ha (34 kg/ha Ca + 17 kg/ha S + 8 kg/ha Mg) and control where no calcium was applied. The treatments had no significant effects on total yield, yield sizes, specific gravity, french fry color, hollow heart or stem-end browning. N-hib Ca however, produced significantly lower sucrose levels in tubers after harvest than the control or Cal-U-Sol. The treatments also produced no significant differences in leaf and petiole or tuber periderm %Ca, %Mg or %K. The highest tuber periderm %Ca were however, noted in gypsum and N-hib Ca treatments.

The results are similar to what was reported a year earlier in relation to most factors except that Cal-U-Sol was the dominant treatment with respect to yield.

RÉACTION DU CULTIVAR DE POMME DE TERRE RUSSET BURBANK À DIVERS TRAITEMENTS AU CALCIUM

Résumé: Divers produits à base de calcium ont été appliqués à un cultivar de pomme de terre Russet Burbank cultivé dans un sol de type Holmesville pour évaluer l'effet de cette application sur le rendement, sur la qualité du tubercule et sur la teneur en calcium de la pelure. Les traitements ont consisté en une application combinée de N-hib Ca (75 kg d'azote et 33 kg de calcium par hectare), une application de 224 kg de nitrate de calcium par hectare (43 kg de calcium et 35 kg d'azote par hectare), une application de 672 kg de gypse par hectare (147 kg de calcium par hectare), une application de 168 kg de Cal-U-Sol par hectare (34 kg de calcium, 17 kg de soufre et 8 kg de magnésium par hectare), et une parcelle témoin dans laquelle on n'avait pas appliqué de calcium. Les traitements n'ont pas eu d'effet considérable sur le rendement total, la grosseur des tubercules, la densité relative, la couleur des frites, le coeur creux, ou le brunissement du talon. On a observé que le taux de sucrose présent dans les tubercules après la récolte était beaucoup moins considérable dans les parcelles traitées au N-hib Ca que dans la parcelle témoin ou que dans les parcelles traitées au Cal-U-Sol. De plus, les traitements n'ont pas modifié sensiblement la feuille et le pétiole ni la teneur de la pelure en calcium, en magnésium, ou en potassium. On a toutefois noté que la plus haute teneur en calcium de la pelure était associée aux traitements avec le gypse et le N-hip Ca.

Les résultats sont semblables à ceux enregistres l'année précédente pour la plupart des facteurs, sauf que le Cal-U-Sol représentait alors le meilleur traitement pour le rendement.

INTRODUCTION: The importance of calcium (Ca) in the production of peanuts has been well documented and it is only in recent years that attention has been focused on Ca nutrition in potato tuber health and development. Several researchers have shown the importance of high Ca concentration in the potato tuber to be necessary to reduce bacterial soft rots (Engelhard, 1989). Problems with Ca deficiency in potatoes are localized in the tuber and not the foliage. This is a result of several factors. Firstly, Ca is taken up by the roots and moves exclusively through the xylem to the leaves - the tubers are by-passed. Secondly, Ca in the leaves does not move back down to the tubers as movement of Ca in phloem is minimal. Thirdly, tubers and stolons must take up needed Ca directly from the soil through their unsuberised tips. As a result, proper Ca nutrition of tubers requires stolens and tubers to be immediately surrounded by high levels of calcium.

Thorne (1989) reported that Internal Brown Spot (IBS), a disorder in tubers prevalent under conditions of intense summer temperature changes and rapid vine growth, is the result of inadequate Ca nutrition. It is postulated that since the foliage of potato plants compete for Ca with the tuber, under rapid vine growth and rapid moisture withdrawal, Ca may actually be pulled away from the tuber resulting in IBS. Liquid calcium ammonium nitrate 17 (CAN 17 - 8% Ca; 11.6% nitrate N), supplying 28 kg/ha of Ca was found to be as effective for increasing Ca content of the potato tuber periderm as 252 kg/ha of calcium supplied through 509 kg. of gypsum; and thus reducing IBS. Indeed, Ca% in the tuber periderm has been shown to be a good indicator of Ca content of the tuber itself. Engelhard (1989) reported ranges of Ca in the tuber periderm to be 0.057 - 0.277%.

Simmons et al (1988) have shown that gypsum (pelleted, sieved or granulated) applied broadcast, side-dressed or in a preplant strip is an excellent source of Ca and effective in increasing tuber periderm Ca concentration. Stoller (1989) in setting up a model for Ca as the "second messenger", stated that Ca will move into the tuber, only if the tuber loses water, and further that when potatoes are heavily watered, tubers closer to the soil surface will often have fewer Ca related problems, because they lose more moisture.

Stoller (1989), in recognizing that Ca allows the crop to use more ammonium nitrogen, introduced a product called N-hib Calcium - a calcium/urea formulation (18% N; 8% Ca) for use in potatoes and other crops. Increased yields, increased tuber periderm %Ca, increased phosphate in petioles, increased K and Mg in tissues, better quality and higher specific gravity have all been associated with the use of the product, (Stoller, 1989). With all this increasing emphasis on Ca and potato yields, it was decided to examine several calcium supplying products over the next 2 years, to observe their effects on potato yield and quality and tuber periderm %Ca. It was decided to examine the following products:

- N-hib Calcium - 18% N; 6% Ca.
- Gypsum - 22% Ca; 16% S.
- Cal-U-Sol - 20% Ca; 10% S and 4.5% Mg.
- Calcium nitrate - 19% Ca; 15.5% N.

METHODS: Cut seed (60g approximately) of Russet Burbank was planted on the Holmesville clay loam soil series (pH 5.4) on May 28, 1990. Rotation in the field was potatoes, clover, clover, potatoes. A RCBD was employed and the following treatments were imposed:

Treatments

1. Basic fertilizer application - 1232 kg/ha 15-15-15 banded at planting with no calcium - control.

2. Basic fertilizer application - 1232 kg/ha 10-20-20 banded at planting plus 112 L/ha N-hib Ca (9% N, 9% Ca) sprayed on two of the rows at planting + 326 L/ha N-hib Ca (18% N, 6% Ca) side-dressed on July 12.
   - Density of N-hib Ca - 5.76 kg/4.5 L.

3. Basic fertilizer application - 1232 kg/ha 12-15-15 banded at planting plus 224 kg/ha calcium nitrate (19% Ca; 15.5% N) side-dressed on July 3.

4. Basic fertilizer application - 1232 kg/ha 15-15-15 banded at planting plus 672 kg/ha of gypsum (22% Ca, 16% S) top-dressed post-planting on May 29.

5. Basic fertilizer application - 1232 kg/ha 15-15-15 banded at planting plus 168 kg/ha Ca.-U-Sol (20% Ca, 10% S, 4.5% Mg) mixed in with the fertilizer.

The crop was harvested on October 18. Soil and leaf analyses were taken at mid-season. Tuber periderm %Ca was determined by peeling tubers with a carrot peeler. The month of July was dry during the period of tuber development.

RESULTS AND DISCUSSION: Soil Analyses: Table 1 shows the mean soil analyses at 8 weeks post application of treatments. Plots were selected with low Ca levels (<1000 kg/ha Ca) to generate the greatest effect from the applied calcium treatments. Only the gypsum had any measured effect upon the Ca level.

TABLE 1: Mean Soil Analyses of Different Calcium Treatments 8 Weeks Post Application.

		Soil Analyses kg/ha			
Treatments	pH	P_2O_5	K_2O	Ca	Mg
1. No calcium	5.6	513+	416	871	60
2. Calcium nitrate - 224 kg/ha	5.7	513+	450+	956	57
3. N-hib Ca	5.7	513+	450+	905	34
4. Gypsum - 672 kg/ha	5.7	513+	450+	1257	33
5. Cal-U-Sol - 168 kg/ha	5.7	513+	450+	898	73

YIELDS: Table 2 shows the yield of the Russet Burbank cultivar with different calcium treatments. All treatments gave an excellent yield though not significantly different from each other. This is similar to what was observed last year.

Cal-U-Sol and calcium nitrate produced the highest total yield but the N-hib Ca produced the least off-type tubers. In last year's work, Cal-U-Sol produced the least off-type tubers. Like in the previous year, Cal-U-Sol produced the highest marketable yield. Cal-U-Sol treatments did not senesce earlier than other treatments as it did the previous year.

TABLE 2: Effect of Different Calcium Treatments on Yield of Russet Burbank Potato Cultivar.

	Yield t/ha			
Treatment	Undersized (<84g)	Marketable (84->283g)	Off Type	Total
1. No calcium	6.40	32.85	1.34	40.59
2. Calcium nitrate 224 kg/ha	5.92	34.70	2.04	42.66
3. N-hib Ca	5.86	34.80	0.85	41.51
4. Gypsum-672 kg/ha	6.37	30.46	2.47	39.30
5. Cal-U-Sol-168 kg/ha	5.58	35.55	2.40	43.53

(Treatment Means - not significant at 0.05 level)

Specific Gravity, Sucrose Content, French Fry Color: Table 3 shows the data for the effect of the various calcium treatments on specific gravity, french fry color and sucrose content after harvest. The treatments had no significant effect upon specific gravity or french fry color. N-hib Ca however, produced a significantly lower sucrose content in tubers than the control or Cal-U-Sol. Last year's treatments produced no significant differences among the treatments in relation to these qualities (Hinds and Pelletier 1989).

TABLE 3: Effect of Different Ca Treatments on Specific Gravity, Sucrose Content and French Fry color of Russet Burbank.

Treatment	Specific Gravity	Sucrose Content mg/g	French Fry Color
1. No calcium	1.07	1.71^{A}	1.9
2. Calcium nitrate 224 kg/ha	1.07	1.24^{BC}	2.1
3. N-hib Ca	1.07	1.04^{C}	2.2
4. Gypsum - 672 kg/ha	1.07	1.32^{ABC}	2.1
5. Cal-U-Sol - 168 kg/ha	1.07	1.52^{AB}	2.1

(Duncan's Multiple Range Test - 0.05 level. Means with the same letter are not significantly different from each other).

Stem-End Browning and Hollow Heart: Little or no stem-end browning and hollow heart were observed in the treatments. Less than 0.25% of the tubers had any defects.

Leaf and Petiole Analyses: Table 4 shows data in relation to leaf and petiole %Ca, Mg and K for all treatments at mid-season. There were no significant differences between treatments. Similar results were reported last year.

TABLE 4: Mean Leaf and Petiole Analyses on Russet Burbank at Mid-Season with Different Ca Treatments.

Treatment	%		
	Ca	Mg	K
1. No calcium	0.52	0.29	2.44
2. Calcium nitrate - 224 kg/ha	0.48	0.28	2.66
3. N-hib Ca	0.50	0.28	2.57
4. Gypsum - 672 kg/ha	0.56	0.28	2.61
5. Cal-U-Sol - 168 kg/ha	0.55	0.34	3.59

(Treatment Means - not significant at 0.05 level).

Tuber Periderm Analyses: Table 5 shows data on tuber periderm %Ca, Mg and K for all treatments after harvest. There were no significant differences between treatments with respect to these nutrients as was the case last year as well. However, gypsum and N-hib Ca had the highest level of %Ca in the periderm.

TABLE 5: Tuber Periderm Analyses on Russet Burbank With Different Calcium Treatments After Harvest.

Treatment	%		
	Ca	Mg	K
1. No calcium	0.08	0.14	3.66
2. Calcium nitrate - 224 kg/ha	0.08	0.13	3.56
3. N-hib Ca	0.10	0.15	3.96
4. Gypsum - 672 kg/ha	0.12	0.14	3.65
5. Cal-U-Sol - 168 kg/ha	0.09	0.15	3.77

(Treatment Means - not significant at 0.05 level)

CONCLUSION: The different calcium treatments had no significant effect upon total yield and yield sizes, though Cal-U-Sol and calcium nitrate produced the highest yield. The calcium treatments had no significant impact on specific gravity, french fry color, hollow heart or stem-end browning. However, N-hib Ca produced significantly lower sucrose levels in tubers than the control or Cal-U-Sol. The treatments did not also produce significant differences in leaf and petiole or tuber periderm %Ca, Mg and K. The highest tuber periderm %Ca were noted in gypsum and N-hib treatments.

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REFERENCES:

1. Engelhard, A.W., ed. 1989. Management of Diseases with macro and microelements, APS Press. pp 102-123; 152-166.

2. Hinds, R.P., and G. Pelletier, 1989. Response of Russet Burbank Potato Cultivar to Different Calcium Treatments. Ad. Res. Rep. P.I.B. NBDA.

3. Simmons, K.E., Kelling, K.A., Wolkowski, R.P., and A. Kelman. 1988. Effect of calcium source and application method on potato yield and cation composition. Agron. J. 80: 13-21.

4. Thorne, T., 1989. Internal Brown Spot can be controlled. Pot.Grower of Id. May 1989. pp 28-29.

5. Stoller, J.H., 1989. Proper use of calcium improves potato quality. Pot. Grower of Id. Jan. 1989. pp 30-31.

EFFECT OF DIFFERENT RATES OF CALCIUM NITRATE ON YIELD OF RUSSET BURBANK

R.P. Hinds and G. Pelletier

ABSTRACT: Calcium nitrate was applied side-dressed at the rate of 0, 56, 112, 168 and 224 kg/ha to Russet Burbank potato cultivar at the time of tuber initiation to observe its effect upon yield, tuber quality and tuber periderm % Ca. None of the treatments had any significant effect on yield, specific gravity, french fry color, sucrose content, leaf or tuber periderm % Ca, % Mg or % K.

EFFET DE DIFFÉRENTS TAUX DE NITRATE DE CALCIUM SUR LE RENDEMENT DU CULTIVAR RUSSET BURBANK

Résumé: Le nitrate de calcium a été épandu en bandes latérales sur le cultivar de pomme de terre Russet Burbank à raison de 0, 56, 112, 168 et 224 kg par hectare pendant la période de formation du tubercule, afin d'observer l'effet de ces applications sur le rendement, la qualité du tubercule et la teneur en calcium de la pelure. Aucun des traitements n'a eu d'effet considérable sur le rendement, la densité relative, la couleur des frites, le taux de sucrose et la teneur des feuilles ou de la pelure en calcium, en magnésium ou en potassium.

INTRODUCTION: Calcium (Ca) is an essential nutrient for potatoes. Several disorders or diseases have been linked with Ca insufficiency or imbalance, including common scab, soft rot and internal brown spot. Soils in many potato growing areas, including N.B., have low available Ca. These soils typically have low pH, little lime and are in areas where natural precipitation has leached out much of the available Ca out of the soil profile. It is under these latter conditions that the above mentioned disorders have appeared.

It has become increasingly doubtful whether traditional soil and tissue testing for determining Ca sufficiency do in fact, indicate tuber needs over the growing season, because of the immobile nature of Ca in potato plants.

Ca has long been considered an immobile nutrient, that is, it moves from the site of uptake in the main roots up the plant to new leaf tissue. Ca does not readily move from vegetative tissue down to tubers. This characteristic suggests that conventional fertilization of Ca to the main roots of potato may not be the most efficient means of improving Ca absorption by tubers. Recent work at the Hancock Experiment Station, University of Wisconsin, suggests that the small roots located on the stolens and tubers are the primary contributors to Ca accumulation by tubers during the growing season. These results suggest that under conditions where increased Ca uptake is desired by tubers, Ca fertilizer placement during the growing season should be very near the stolens and tubers (Potato Grower of Id Report, 1990). Consequently, it has been decided to apply different rates of calcium nitrate to the hill during tuber bulking, to examine the effects upon yield and tuber periderm Ca %. The Ca in calcium nitrate is readily available for root uptake.

METHODS: Calcium nitrate was applied at the rate of 0, 56, 112, 168, 224 kg/ha side-dressed to Russet Burbank potato cultivar at the time of tuber initiation July 4-8, 1990. A RCBD was employed with 4 replications. Cultivations and final hilling allowed the calcium nitrate to remain in the hill where the tubers were to develop. Plots were selected on the Holmesville soil series where Ca levels were low (less than 1,000 kg/ha Ca). Plot size was $55.8 m^2$ and the calcium nitrate contained 19% Ca and 15.5% N. The crop was fertilized with 1,120 kg/ha 15-15-15 blend.

RESULTS AND DISCUSSION: **Soil Analyses:** Table 1 shows the mean soil analyses prior to planting. Plots were selected where the Ca levels were low to medium as best results have been reported under low Ca soil levels (< 1,000 kg/ha Ca) prior to treatment.

TABLE 1: Mean Soil Analyses of Different Calcium Treatments Prior to Planting

Treatment	Soil Analysis kg/ha				
	pH	**P_2O_5**	K_2O	Ca	Mg
1. No calcium nitrate	5.9	513+	194	763	107
2. 56 kg/ha calcium nitrate	5.8	513+	170	778	95
3. 112 kg/ha calcium nitrate	6.1	513+	204	985	142
4. 168 kg/ha calcium nitrate	5.8	513+	223	956	158
5. 224 kg/ha calcium nitrate	6.0	513+	220	1009	166

YIELDS: Table 2 shows the yield of Russet Burbank cultivar with different calcium nitrate rates. All the treatments including the control gave an excellent yield, but there were no tubers > 283 g in size which may be directly related to the low K levels found in the leaf and petiole at mid-season (Table 4). The different rates had no significant effect upon yield though the higher levels of calcium produced higher yields.

Stem-End Browning and Hollow Heart: Less than 1% of the tubers had stem-end browning and hollow heart and there were no significant differences between treatments.

TABLE 2: Effect of Different Rates of Calcium Nitrate on Yields of Russet Burbank Potato Cultivar.

	yield t/ha		
Treatment	Undersized (<84g)	Marketable (84-283g)	Total
1. No calcium nitrate	9.24	35.46	44.70
2. 56 kg/ha calcium nitrate	9.04	34.75	43.79
3. 112 kg/ha calcium nitrate	8.43	36.79	45.22
4. 168 kg/ha calcium nitrate	14.02	36.78	50.80
5. 224 kg/ha calcium nitrate	10.97	37.25	48.22

Specific Gravity, Sucrose Content and French Fry Color: Table 3 shows the data for the effect of the different rates of calcium nitrate on specific gravity, sucrose content and french fry color. None of the treatments had any significant effect upon these factors.

TABLE 3: Effect of Different Rates of Calcium Nitrate on Tuber Specific Gravity, Sucrose Content and French Fry Color of Russet Burbank

Treatment	Specific Gravity	Sucrose Content mg/g	French Fry* Color
1. No calcium nitrate	1.09	1.43	1.1
2. 56 kg/ha calcium nitrate	1.09	1.37	1.2
3. 112 kg/ha calcium nitrate	1.09	1.24	1.2
4. 168 kg/ha calcium nitrate	1.09	1.45	1.1
5. 224 kg/ha calcium nitrate	1.09	1.40	1.2

(Treatment Means - not significant at 0.05 level)
* French Fry Color 0-4 is acceptable by trade.

Leaf and Petiole Analyses: Table 4 shows data in relation to leaf and petiole %Ca, % Mg and %K for all treatments at mid-season. There were no significant differences between treatments but the %K levels were so low (normal range >3%) that yield sizes may have been adversely affected.

TABLE 4: Mean Leaf and Petiole Analyses on Russet Burbank with Different Rates of Calcium Nitrate at Mid-Season.

Treatment	%		
	Ca	Mg	K
1. No calcium nitrate	0.63	0.41	1.79
2. 56 kg/ha calcium nitrate	0.61	0.38	1.70
3. 112 kg/ha calcium nitrate	0.65	0.48	1.84
4. 168 kg/ha calcium nitrate	0.62	0.45	1.90
5. 224 kg/ha calcium nitrate	0.66	0.47	1.93

(Treatment Means - not significant at 0.05 level).

Tuber Periderm Analyses: Table 5 shows data on tuber periderm analyses for %Ca, %Mg and %K after harvest. Calcium nitrate applied at tuber initiation and bulking in the tuber zone was expected to raise Ca% levels in the tuber periderm. This was not in evidence as there were no significant differences observed in %Ca, %Mg or %K with the different treatments. The normal range for Ca% in the tuber periderm is 0.057 - 0.277.

TABLE 5: Tuber Periderm Analyses on Russet Burbank with Different Rates of Calcium Nitrate.

Treatment	%		
	Ca	Mg	K
1. No calcium nitrate	0.31	0.13	2.71
2. 56 kg/ha calcium nitrate	0.07	0.13	2.89
3. 112 kg/ha calcium nitrate	0.06	0.13	3.04
4. 168 kg/ha calcium nitrate	0.31	0.12	2.81
5. 224 kg/ha calcium nitrate	0.31	0.20	2.73

(Treatment Means - not significant at 0.05 level).

CONCLUSION: The different rates of calcium nitrate had no significant effect upon total yield, yield sizes. The latter may have been adversely affected by low K content as indicated by leaf and petiole analyses. The different treatments also had no significant effect upon stem-end browning, hollow heart, sucrose content, french fry color, leaf and petiole analyses of %Ca, %Mg, %K or tuber periderm analyses of %Ca, %Mg and %K.

REFERENCES:

Calcium Nutrition and Calcium Nitrate Fertilizer - Potato Grower of Id Report. Mar. 1990. pp 54-55.

GREEN MANURE - GYPSUM EFFECTS ON YIELD AND SCAB INCIDENCE IN THE POTATO CULTIVAR SHEPODY - II

R.P. Hinds and A.F. Perley

ABSTRACT: Green manure strips (fallow, buckwheat, leger barley and winter rye) were established in 1989 on the Holmesville cl[illegible] loam soil series with a history of common scab, caused by **__Streptomyces scabies__**. The strips were chopped, plowed down green in the fall of 1989. Imposed on the strips in 1990 were 4 levels of gypsum (0, 672, 1344 and 2016 kg/ha) in a split plot design, to investigate the effects of green manure with gypsum on yield and scab incidence in the susceptible potato cultivar Shepody, in the absence of irrigation.

Gypsum rate, green manure and their interactions had no significant effect upon yield or scab incidence. In general, though, green manure treatments outyielded the fallow, with the leger barley performing the best both as a main treatment and in combination with 672 and 1344 kg/ha gypsum. Also in general, green manure treatments produced higher yields with less scab than the fallow with the leger barley as a main treatment and in combination with 672 and 1344 kg/ha gypsum showing the best promise in regard to scab reduction. Leger barley green manure treatments produced the lowest % of tubers with hollow heart and stem-end browning. Buckwheat was the worse in relation to hollow heart and stem-end browning.

EFFET DE L'ENGRAIS VERT ET DU GYPSE SUR LE RENDEMENT DE CULTIVARS DE POMME DE TERRE SHEPODY ET SUR LE TAUX DE GALE - II

Résumé: En 1989, une jachère et des cultures de sarrasin, d'orge Léger et de seigle d'hiver ont été constituées pour servir d'engrais vert sur des bandes de terrains composés de loam argileux de type Holmesville habituellement infestés par la gale commune causée par **__Streptomyces scabies__**. Ces cultures ont été hachées et enfouies dans le sol à l'automne de 1989. Les bandes ont reçu en 1990 quatre applications de gypse (0, 672, 1 344 et 2 016 kg par hectare) dans un dispositif expérimental afin d'analyser les effets de l'engrais vert et du gypse sur le rendement et sur le taux de gale dans le cultivar de pomme de terre Shepody sensible à la gale, le tout en l'absence d'irrigation.

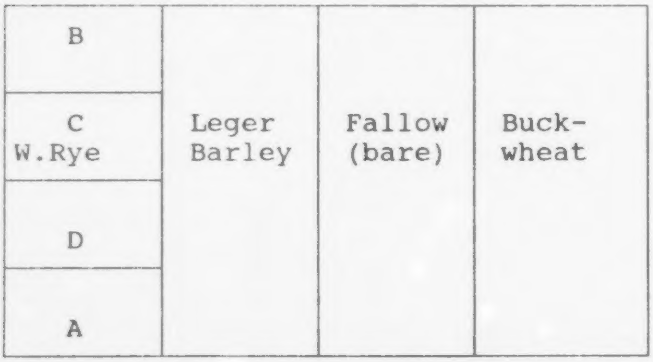
Les applications de gypse et l'engrais vert, ainsi que leurs interactions, n'ont pas eu d'effet considérable sur le rendement ou sur le taux de gale. Toutefois, on a observé que l'engrais vert donnait en général un meilleur rendement que la jachère et que l'orge Léger donnait un meilleur rendement lorsqu'il constituait le principal traitement et qu'il était associé à des applications de 672 et 1 344 kg de gypse par hectare. On a également observé que l'engrais vert produisait en général de meilleurs rendements et des taux inférieurs de gale que la jachère, et que l'orge Léger comme traitement principal et en association avec des applications de 672 et 1 344 kg de gypse par hectare était le traitement le plus prometteur pour réduire la gale. L'engrais vert constitué d'une culture d'orge Léger a donné la plus faible proportion de tubercules atteints du coeur creux et du brunissement du talon. Le sarrasin a été le produit le moins efficace contre le coeur creux et le brunissement du talon.

INTRODUCTION: Common scab of potato, when severe, can severely reduce the quality of an otherwise good marketable crop. According to Bergey's Manual of Determinative Bacteriology, the taxonomic position of causal agent **__Streptomyces scabies__** is still uncertain, but for purposes of this discussion, the pathogen is being referred to as a gram positive filamentous bacterium (Anderson and Lorang, 1988).

Information about plant nutrients in relation to potato scab has been limited in general, to macro and micronutrients, nutrient concentration in soil and infrequently nutrient concentration in potato tubes. Much of the literature on potato scab control deals with the application of nutrients to the soil which also affect soil pH. Under field conditions, disease incidence occurs over a range of pH, from very low 4.5 to over 8.0. But while disease incidence and severity may be pH related, high soil moisture has been shown, regardless of pH, to reduce scab (Hammerschmidt et al, 1989). Gypsum and elemental sulphur have been shown to reduce scab incidence. In addition to plant nutrients to manage scab, other control methods include seed treatments (pentachloronitrobenzine PCNB), crop rotations, green manures, irrigation timing and varietal resistance (Engelhard ed: 1989, Anderson and Lorang, 1988).

Since **S**. **scabies** is ubiquitous and so well adapted, many workers feel no single control strategy will provide total disease control. Indeed elimination of scab may be both unfeasible and unnecessary, since growers, processors and consumers are willing to tolerate some blemishes on tubers. As a result, a three year effort is being designed to examine the combined effects of a green manure with gypsum, under rain-fed production in NB, in an effort to determine the degree of scab control in scab-susceptible commercial varieties on soils with long histories of the disease.

METHOD: Strips of green manure crops were established in 1989 on the Holmesville clay loam soil series, naturally infested with the common scab, **Streptomyces** **scabies**. The strips were planted as indicated below in a split plot design with 4 replications.



Main Plot
Green Manure
Sub-Plot
gypsum Rates

A-0 kg/ha
B-672 kg/ha
C-1344 kg/ha
D-2016 kg/ha

REP I

In 1989, fertilizer at the rate of 336 kg/ha of a blended 18-9-18 was applied to the green manures. Planting was completed on June 6, 1989. The strips were chopped on August 10, 1989 and fall plowed. Dry matter additions to the soil prior to chopping was estimated by random selection of 3 foot square portions of vegetation.

Shepody potato cultivar (scab-susceptible) was planted on May 20, 1990 and gypsum at the rate of 0, 672, 1344 and

2016 kg/ha were imposed on each strip. Gypsum used was 22% Ca and 16% S.

Main plots were 488 m^2 and sub-plots were 122 m^2. Data to be collected over the 3 year period include: O.M.%, soil analyses prior to and 8 weeks post-planting, leaf and petiole analyses at mid-season, yield (quantity and quality), hollow heart, tuber periderm % Ca, specific gravity, sucrose and french fry color. Scab incidence (tuber area % covered with lesions) was determined as per the key outlined in Ca. Plant Dis. Surv. 51: 197).

Basic fertilizer on Shepody was 135 kg/ha N, P and K. The first 3 weeks of July was dry during tuber initiation.

RESULTS AND DISCUSSION: Soil Analyses: Mean soil analyses results for the green manure and gypsum treatments are given in Tables 1 and 2. These plots show low to medium Ca levels, moderately acid and have produced scabby potatoes for the last twelve years. The addition of gypsum has increased Ca levels in the soil. This is usually not the case when soil Ca levels test high.

TABLE 1: Mean Soil Analyses at Four Levels of Gypsum on Shepody - 8 Weeks Post-Planting.

Gypsum Treatments	pH	% O.M.	kg/ha Ca
1. 0 kg/ha	6.1	2.9	1297
2. 672 kg/ha	6.0	2.9	1289
3. 1344 kg/ha	5.8	3.0	1382
4. 2016 kg/ha	5.9	2.8	1340

TABLE 2: Mean Soil Analyses Under Four Green Manure Treatments With Shepody - 8 Weeks Post-Planting.

Green Manure Treatment	pH	% O.M.	kg/ha Ca
1. Fallow	6.0	2.9	1396
2. Buckwheat	6.0	3.0	1423
3. Leger Barley	5.9	2.6	1235
4. Winter Rye	5.9	3.0	1254
5. Fallow (prev.yr.)	5.7	3.0	1259

Dry Matter Additions: Table 3 shows dry matter additions to the soil after 10 weeks of green manure growth in 1989. Leger barley added the greatest amount of dry matter, followed by buckwheat. The higher dry matter additions seemed to have little effect upon the O.M. content of the soil a year later. The fallow plots were harrowed twice to reduce weed population.

TABLE 3: Dry Matter Additions to the Soil From Green Manures - 10 Weeks Post-Planting, 1989.

Green Manure	t/ha Dry Matter Added	% O.M.
1. Fallow	2.4	2.9
2. Buckwheat	8.2	3.0
3. Leger Barley	10.6	2.6
4. Winter Rye	7.8	3.0

Yield: Mean yields for treatment effects (green manures, gypsum rates and their interactions) are given in Table 4. No significant differences were observed between green manures, gypsum rates or gypsum/green manure interactions. Observable trends in the data indicate, however, that the green manure treatments outyielded the fallow treatments with leger barley being the best. Interaction trends showed that leger barley with 672-1344 kg/ha gypsum and winter rye with 1344 kg/ha gypsum were among the best for yields. The fallow/gypsum interactions produced the lowest yields.

TABLE 4: Effect of Four Levels of Gypsum and Four Green Manure Treatments on Yield of Shepody Potato Cultivar.

Treatment	Yield-t/ha			
	<30mm	30-60 mm	>60mm	Total
Green Manures				
1. Fallow	0.28	24.03	13.92	38.23
2. Buckwheat	0.81	25.83	15.59	42.23
3. Leger Barley	0.25	26.04	18.13	44.42
4. Winter Rye	0.16	23.43	18.07	41.66
Gypsum Rates				
5. 0 kg/ha Gypsum	0.51	24.84	16.48	41.47
6. 672 kg/ha [illegible]um	0.36	25.68	15.54	41.58
7. 1344 kg/ha [illegible]psum	0.51	24.31	17.27	41.73
8. 2016 kg/ha Gypsum	0.84	24.49	16.42	41.75
Green Manure x Gypsum Rate				
9. Fallow x 0 kg/ha Gypsum	0.25	23.57	15.13	38.95
10. Fallow x 672 kg/ha Gyp	0.36	24.79	12.60	37.75
11. Fallow x 1344 kg/ha Gyp	0.11	23.37	13.71	37.19
12. Fallow x 2016 kg/ha Gyp	0.43	24.39	14.23	39.05
13. Buckwheat x 0 kg/ha Gyp	0.16	26.11	14.93	41.20
14. Buckwheat x 672 kg/ha Gyp	0.41	25.91	15.54	41.86
15. Buckwheat x 1344 kg/ha Gyp	0.41	25.40	16.05	41.86
16. Buckwheat x 2016 kg/ha Gyp	2.23	25.91	15.85	43.99
17. L.Barley x 0 kg/ha Gyp	0.05	26.83	18.39	45.27
18. L.Barley x 672 kg/ha Gyp	0.51	28.86	15.54	44.91
19. L.Barley x 1344 kg/ha Gyp	0.05	23.47	21.24	44.76
20. L.Barley x 2016 kg/ha Gyp	0.36	25.00	17.37	42.73
21. Wint.Rye x 0 kg/ha Gyp	0.10	22.86	17.48	40.44
22. Wint.Rye x 672 kg/ha Gyp	0.16	23.17	18.49	41.82
23. Wint.Rye x 1344 kg/ha Gyp	0.05	25.00	18.08	43.13
24. Wint.Rye x 2016 kg/ha Gyp	0.33	22.68	18.24	41.25

(Treatment means not significant at 0.05 level)

Scab Incidence: The incidence of scab in Shepody with four green manures and gypsum, is shown in Table 5. Scab incidence in general, was low and no significant differences were observed between green manure treatments, gypsum rates or their interactions. Trends were in evidence, however. The green manure treatments produced a greater yield of tubers with less scab than the fallow treatment, with leger barley being the best. Also the leger barley treatment with 672-1344 kg/ha gypsum as well as the winter rye with 1344 kg/ha gypsum produced the highest yields with the least scab incidence.

TABLE 5: Effect of Four Levels of Gypsum and Four Green Manure Treatments on Scab Incidence in Shepody Potato Cultivar.

	Yield-t/ha		
	Tuber Area With Scab Lesions		
Treatment	0-10%	>10%	Total
Green Manures			
1. Fallow	37.28	0.95	38.23
2. Buckwheat	40.66	1.57	42.23
3. Leger Barley	43.60	0.82	44.42
4. Winter Rye	41.08	0.58	41.66
Gypsum Rates			
5. 0 kg/ha Gypsum	40.85	0.62	41.47
6. 672 kg/ha Gypsum	40.12	1.46	41.58
7. 1344 kg/ha Gypsum	40.83	0.90	41.73
8. 2016 kg/ha Gypsum	40.82	0.90	41.75
Green Manure x Gypsum Rate			
9. Fallow x 0 kg/ha Gypsum	38.27	0.68	38.95
10. Fallow x 672 kg/ha Gyp	36.57	1.18	37.75
11. Fallow x 1344 kg/ha Gyp	36.00	1.19	37.19
12. Fallow x 2016 kg/ha Gyp	38.25	0.80	39.05
13. Buckwheat x 0 kg/ha Gyp	40.18	1.02	41.20
14. Buckwheat x 672 kg/ha Gyp	38.73	3.13	41.86
15. Buckwheat x 1344 kg/ha Gyp	41.09	0.77	41.86
16. Buckwheat x 2016 kg/ha Gyp	42.65	1.34	43.99
17. L.Barley x 0 kg/ha Gyp	44.66	0.61	45.27
18. L.Barley x 672 kg/ha Gyp	44.58	0.33	44.91
19. L.Barley x 1344 kg/ha Gyp	43.41	1.35	44.76
20. L.Barley x 2016 kg/ha Gyp	41.75	0.98	42.73
21. Wint.Rye x 0 kg/ha Gyp	40.27	0.17	40.44
22. Wint.Rye x 672 kg/ha Gyp	40.62	1.20	41.82
23. Wint.Rye x 1344 kg/ha Gyp	42.83	0.30	43.13
24. Wint.Rye x 2016 kg/ha Gyp	40.61	0.64	41.25

(Treatment means not significant at 0.05 level)

Leaf/Petiole and Tuber Periderm % Ca: No significant differences were observed between leaf/petiole and tuber periderm % Ca of the gypsum treatments (Table 6). The data was similar for the green manure effects.

TABLE 6: Mean Leaf/Petiole and Tuber Periderm % Ca of Shepody as Affected by Four Levels of Gypsum.

Treatment	Leaf/Petiole % Ca	Tuber Periderm % Ca
1. 0 kg/ha Gypsum	0.87	0.09
2. 672 kg/ha Gypsum	0.84	0.09
3. 1344 kg/ha Gypsum	0.84	0.08
4. 2016 kg/ha Gypsum	0.85	0.08

French Fry Color, Sucrose Content and Specific Gravity: Table 7 shows the specific gravity, french fry color and sucrose content of Shepody as affected by four levels of gypsum. No significant differences were observed between treatments. Similar values for these qualities were observed under the green manure treatments.

TABLE 7: Specific Gravity, French Fry Color and Sucrose Content of Shepody as Affected by Four Levels of Gypsum.

Treatment	Specific Gravity	Fry Color* USDA Values	Sucrose mg/g
1. 0 kg/ha Gypsum	1.074	1.3	1.3
2. 672 kg/ha Gypsum	1.073	1.1	1.2
3. 1344 kg/ha Gypsum	1.074	1.1	1.3
4. 2016 kg/ha Gypsum	1.074	1.1	1.6

* USDA values of 1-4 are acceptable by processing trade.

Hollow Heart and Stem-End Browning: Observations on hollow heart and stem-end browning were made from the examination of 25 tubers in each plot and the relevant data are given in Table 8. Leger barley green manure produced the least amount of hollow heart and stem-end browning and buckwheat was the worst. Fallow/gypsum interactions and leger barley/gypsum interactions produced the least % of tubers with hollow heart. Buckwheat/gypsum interactions was the worst with regard to hollow heart. Leger barley/gypsum interactions produced the least % tubers with stem-end browning and buckwheat/gypsum interactions were the worst.

TABLE 8: Effect of Four Levels of Gypsum and Four Green Manure Treatments on Hollow Heart and Stem-End Browning of Shepody Potato Cultivar.

Treatment	% Tubers Affected	
	Hollow Heart	Stem-End Browning
Green Manures		
1. Fallow	0	5
2. Buckwheat	7	7
3. Leger Barley	1	0
4. Winter Rye	3	3
Gypsum Rates		
5. 0 kg/ha Gypsum	1	6
6. 672 kg/ha Gypsum	5	4
7. 1344 kg/ha Gypsum	3	2
8. 2016 kg/ha Gypsum	1	2
Green Manure x Gypsum Rates		
9. Fallow x 0 kg/ha Gypsum	0	2
10. Fallow x 672 kg/ha Gypsum	0	3
11. Fallow x 1344 kg/ha Gypsum	0	0
12. Fallow x 2016 kg/ha Gypsum	0	0
13. Buckwheat x 0 kg/ha Gypsum	1	1
14. Buckwheat x 672 kg/ha Gypsum	4	1
15. Buckwheat x 1344 kg/ha Gypsum	1	2
16. Buckwheat x 2016 kg/ha Gypsum	1	2
17. L.Barley x 0 kg/ha Gypsum	0	0
18. L.Barley x 672 kg/ha Gypsum	0	0
19. L.Barley x 1344 kg/ha Gypsum	1	0
20. L.Barley x 2016 kg/ha Gypsum	0	0
21. Winter Rye x 0 kg/ha Gypsum	1	3
22. Winter Rye x 672 kg/ha Gypsum	1	0
23. Winter Rye x 1344 kg/ha Gypsum	1	0
24. Winter Rye x 2016 kg/ha Gypsum	0	0

(Treatment means not significant at 0.05 level)

CONCLUSIONS: Gypsum treatments in the low to medium soil test soils increased Ca content but dry matter additions had no effect after the first year on O.M.% measured.

Gypsum, green manure treatments or their interactions had no significant effect upon yield or scab incidence. However, with regard to yields, indications are that the green manure treatments outyielded the fallow treatment with leger barley being the best. The leger barley treatment with 672-1344 kg/ha gypsum and the winter rye with 1344 kg/ha gypsum interaction were the better treatments for yield.

Similarly with scab incidence, green manure treatments produced a greater yield of tubers with less scab than the fallow, with leger barley being the best. Also the leger barley with 672-1344 kg/ha gypsum as well the winter rye with 1344 kg/ha gypsum produced the best yields with the least scab incidence.

No significant differences were noted between the treatments in relation to tuber periderm % Ca, leaf/petiole % Ca, sucrose content, french fry color or specific gravity.

Leger barley green manure produced the lowest % of tubers with hollow heart and stem-end browning. Buckwheat was the worst for hollow heart and stem-end browning. Fallow/gypsum and leger barley/gypsum interactions produced the least % of tubers with hollow heart whereas buckwheat/gypsum interactions were the worst. leger barley/gypsum interactions produced the least % of tubers with stem-end browning. Buckwheat/gypsum interactions were the worst for stem-end browning.

REFERENCES:

1. Anderson, N.A., and Lorang, J.M. 1988. Potato Scab: An old disease presents new control opportunities. Valley Pot. Grower. December, 1988. p.14.

2. Davis, J.R., Garner, J.G., and R.M. Callihan. 1974. Effects of gypsum, sulphur, terraclor and terrador Super-X for potato scab control. Am. Pot. J. 51: 35-43.

3. Engelhard, A.W. ed. 1989. Management of Diseases with Macro and Microelements. pp 102-123, 152-166.

4. Hammerschmidt, R., Vitosh, M.L., Hanson, L.E., and M.L. Zacy. 1989. Effect of Cultural Practices on Incidence of Common Scab (Streptomyces scabies) of Potato. Am. Pot. J. 66: p. 524.

5. Hinds, R.P. 1983. Gypsum/Limestone effects upon yield of potatoes. Pot. Prod. Reports. Pot. Div. NBDA.

6. Simmons, K.F., and K.A. Kelling. 1987. Potato Responses to Calcium Application on Several Soil Types. Am. Pot. J. 64: 119-136.

GREEN MANURE - GYPSUM EFFECTS ON YIELD AND SCAB INCIDENCE IN THE POTATO CULTIVAR SHEPODY - I

R.P. Hinds and A.F. Perley

ABSTRACT: Green manure strips (fallow, triple-mix, annual ryegrass and leger barley) were established in 1989 on the Holmesville clay loam soil series with a history of common scab caused by **Streptomyces scabies**. The strips were chopped and plowed down green in the fall of 1989. Imposed on the strips in the spring of 1990 were 4 levels of gypsum (0, 672, 1344 and 2016 kg/ha) in a split plot design, to investigate the effects of a green manure with gypsum on yield and scab incidence in the scab-susceptible potato cultivar, Shepody, in the absence of irrigation. This study is part of a program to develop, in the absence of varietal resistance, an integrated disease management program to effectively reduce scab under NB conditions.

The gypsum, green manure and their interactions had no significant effect upon total yield, scab incidence, hollow heart, stem-end browning, tuber periderm % Ca or leaf/petiole % Ca. No significant differences were observed between the treatments in relation to specific gravity, french fry color or sucrose content, though 1344 kg/ha gypsum was better than other treatments in this regard. Very little scab incidence was reported among scab-susceptible cultivars grown this year in NB.

EFFET DE L'ENGRAIS VERT ET DU GYPSE SUR LE RENDEMENT DE CULTIVARS DE POMME DE TERRE SHEPODY ET SUR LE TAUX DE GALE - 1

Résumé: En 1989, une jachère et des cultures de triple mélange, d'ivraie annuel et d'orge Léger ont été constituées pour servir d'engrais vert sur des bandes de terrains composés de loam argileux de type Holmesville habituellement infestés par la gale commune causée par **Streptomyces scabies**. Ces cultures ont été hachées et enfouies dans le sol à l'automne de 1989. Les bandes ont reçu en 1990 quatre applications de gypse (0, 672, 1 344 et 2 016 kg par hectare) dans un dispositif expérimental afin d'analyser les effets de l'engrais vert et du gypse sur le rendement et sur le taux de gale dans le cultivar de pomme de terre Shepody sensible à la gale, le tout en l'absence d'irrigation. Cette étude faisait partie d'un programme visant à mettre au point, en l'absence de résistance variétale, un programme complet de lutte contre la maladie pour réduire véritablement la gale dans le contexte du Nouveau-Brunswick.

Les applications de gypse et l'engrais vert, ainsi que leurs interactions, n'ont pas eu d'effet considérable sur le rendement total, le taux de gale, le coeur creux, le brunissement du talon, la teneur de la pelure en calcium ou la teneur de la feuille/du pétiole en calcium. Les divers traitements ne présentaient pas d'écart important en ce qui concerne la densité relative, la couleur des frites ou la teneur en sucrose, même si l'application de 1 344 kg de gypse par hectare s'est avérée meilleure que les autres traitements à cet égard. On a signalé un très faible taux de gale chez les cultivars sensibles à la gale qui ont été cultivés cette année au Nouveau-Brunswick.

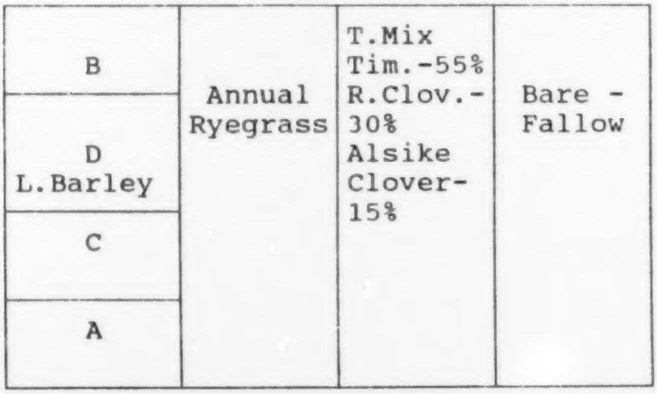
INTRODUCTION: Common scab of potato, when severe, can severely reduce the quality of an otherwise good marketable crop. According to Bergey's Manual of Determinative Bacteriology, the taxonomic position of the causal agent **Streptomyces scabies** is still uncertain, but for purposes of this discussion, the pathogen is being referred to as a gram positive filamentous bacterium (Anderson and Lorang, 1988).

Information about plant nutrients in relation to potato scab has been limited in general, to macro and micronutrients, nutrient concentration in soil and infrequently nutrient concentration in potato tubers.

Much of the literature on potato scab control deals with the application of nutrients to the soil which also affect soil pH. Under field conditions, disease incidence occurs over a range of pH, from very low 4.5 to over 8.0. But while disease incidence and severity may be pH related, high soil moisture has been shown, regardless of pH, to reduce scab (Hammerschmidt et al, 1989). Gypsum and elemental sulphur have been shown to reduce scab incidence. In addition to plant nutrients to manage scab, other control methods include seed treatments (Pentachloronitrobenzine PCNB), crop rotations, green manures, irrigation timing and varietal resistance (Engelhard ed: 1989, Anderson and Lorang, 1988).

Since **S. scabies** is ubiquitous and so well adapted, many workers feel no single control strategy will provide total disease control. Indeed elimination of scab may be both unfeasible and unnecessary, since growers, processors and consumers are willing to tolerate some blemishes on tubers. As a result, a three year effort is being designed to examine the combined effects of a green manure with gypsum, under rain-fed production in NB, in an effort to determine the degree of scab control in scab-susceptible commercial varieties on soils with long histories of the disease. This study represents only a preliminary look at the possible outcomes and will serve as a basis for work to be enjoined and continued.

METHOD: Strips of green manure crops were established in 1989 on the Holmesville clay loam soil series, naturally infested with the common scab, **Streptomyces scabies**. The strips were Fallow (bare), Triple Mix (Timothy 55%, Red clover 30%, Alsike clover 15%), Ryegrass and Leger Barley as shown below. A split plot design with 4 replications was employed.



REP I

Main Plot
Green Manures
Sub-Plot
Gypsum Rates
A-0 kg/ha
B-672 kg/ha
C-1344 kg/ha
D-2016 kg/ha

In 1989, fertilizer at the rate of 336 kg/ha of a blended 18-9-18 was applied to the green manures. Planting was completed on June 6, 1989. The strips were chopped on August 10, 1989 and fall plowed. Dry matter additions to the soil prior to chopping was estimated by random selection of 3 foot square portions of vegetation.

Shepody potato cultivar (scab-susceptible) was planted on May 20, 1990 and gypsum at the rate of 0, 672, 1344 and 2016 kg/ha were imposed on each strip. Gypsum used was 22% Ca and 16% S. Date of harvest was September 18, 1990. Main plots were 488 m^2 and sub-plots were 122 m^2. Data to be collected over the 3 year period include: O.M.%, soil analyses prior to and 8 weeks post-planting, leaf and petiole analyses at mid-season, yield (quantity and quality), hollow heart, tuber periderm % Ca, specific gravity, sucrose and french fry color. Scab incidence (tuber area % covered with lesions) was determined as per the key outlined in Can. Plant Dis. Surv. 51: 197.

Basic fertilizer on Shepody was 135 kg/ha N, P and K. The period of tuber initiation (1st three weeks of July) was dry.

RESULTS AND DISCUSSION: Soil Analyses: Mean soil analyses results for the green manure and gypsum treatments are given in Tables 1 and 2. Given the high pH, good O.M.% and high Ca levels on plots with a long history of scab, the probability of scab incidence was very high. Indeed, it was under conditions such as these that Davis et al (1974) demonstrated scab reduction by applying gypsum and elemental S to soil which had a pH of 7.7.

TABLE 1: Mean Soil Analyses at Four Levels of Gypsum on Shepody - 8 Weeks Post-Planting.

Gypsum Treatments	pH	% O.M.	kg/ha Ca
1. 0 kg/ha	6.9	3.4	2897
2. 672 kg/ha	7.2	3.3	3103
3. 1344 kg/ha	7.0	3.4	2774
4. 2016 kg/ha	7.0	3.3	2723

TABLE 2: Mean Soil Analyses Under Four Green Manure Treatments With Shepody - 8 Weeks Post-Planting.

Gypsum Treatments	pH	% O.M.	kg/ha Ca
1. Fallow	6.5	3.4	2420
2. Triple-Mix	7.1	3.4	3119
3. Ryegrass	7.3	3.2	3191
4. Leger Barley	7.3	3.3	3128
5. Fallow (prev.yr.)	6.9	3.5	2658

Dry Matter Additions: Table 3 shows dry matter additions to the soil after 10 weeks of growth in 1989. Leger barley added the greatest amount of dry matter to the soil. The fallow plots were harrowed twice to reduce the weed population but there was still dry matter additions from weeds that approached that from the triple-mix.

TABLE 3: Dry Matter Additions to the Soil From Green Manures - 10 Weeks Post-Planting, 1989.

Green Manure	t/ha Dry Matter Added	O.M.%
1. Fallow	2.90	3.4
2. Triple-Mix	4.25	3.4
3. Ryegrass	6.25	3.2
4. Leger Barley	9.50	3.3

The higher dry matter additions as green manures could be expected to have a greater effect on scab reduction. No significant change in O.M.% was observed from the dry matter additions after this first year.

Yield: Table 4 shows the mean yields for treatment effects (green manures, gypsum rates and their interactions). No significant differences were observed between green manure treatments, gypsum rates or gypsum/green manure interactions nor were there any observable trends in the yield data. Previous work (Hinds and Perley, 1989) through observation plots had indicated higher yields from red clover green manure versus a grass like timothy.

Scab Incidence: The literature is replete with work indicating that the incidence of scab is reduced through the addition of gypsum and sulfur (David et al, 1974), green manures, crop rotations (Anderson and Lorang, 1988) and green manures and irrigation (Hammerschmidt et al, 1989). Hinds and Perley (1989) in observation plots observed that red clover increased scab incidence in Yukon Gold, a yellow flesh cultivar. Hammerschmidt et al (1989) observed that red clover had significantly increased scab compared to other green manures. The incidence of scab in Shepody with four green manures and gypsum is given in Table 5. The incidence of scab was very low and no significant differences were observed between green manure treatments, gypsum rates or their interactions. The data showed no trends but it should be noted that very little scab was in evidence this year in scab-susceptible cultivars grown.

TABLE 4: Effect of Four Levels of Gypsum and Four Green Manure Treatments on Yield of Shepody Potato Cultivar.

Treatment	Yield-t/ha			
	<30mm	30-60 mm	>60mm	Total
Green Manures				
1. Fallow	0.37	18.19	18.04	36.60
2. Triple-Mix	0.48	19.38	14.58	34.44
3. Ryegrass	0.53	19.61	15.59	35.73
4. Leger Barley	0.24	19.53	16.81	36.58
Gypsum Rate				
5. 0 kg/ha Gypsum	0.32	19.91	16.29	36.52
6. 672 kg/ha Gypsum	0.33	19.69	15.59	35.61
7. 1344 kg/ha Gypsum	0.63	18.77	15.77	35.17
8. 2016 kg/ha Gypsum	0.35	18.34	17.37	36.06
Green Manure x Gypsum Rate				
9. Fallow x 0 kg/ha Gypsum	0.35	17.58	18.11	38.07
10. Fallow x 672 kg/ha Gyp	0.41	17.58	19.20	37.19
11. Fallow x 1344 kg/ha Gyp	0.35	19.31	17.58	37.24
12. Fallow x 2016 kg/ha Gyp	0.36	16.25	17.28	33.89
13. Trip-Mix x 0 kg/ha Gyp	0.45	22.26	11.89	34.60
14. Trip-Mix x 672 kg/ha Gyp	0.51	18.90	14.32	33.73
15. Trip-Mix x 1344 kg/ha Gyp	0.46	17.88	13.82	32.16
16. Trip-Mix x 2016 kg/ha Gyp	0.51	18.49	18.29	37.29
17. Ryegrass x 0 kg/ha Gyp	0.31	18.49	17.27	36.07
18. Ryegrass x 672 kg/ha Gyp	0.21	21.74	13.00	34.95
19. Ryegrass x 1344 kg/ha Gyp	1.31	20.52	14.83	36.66
20. Ryegrass x 2016 kg/ha Gyp	0.31	17.67	17.27	35.25
21. L.Barley x 0 kg/ha Gyp	0.16	19.30	17.88	37.34
22. L.Barley x 672 kg/ha Gyp	0.21	20.52	15.85	36.58
23. L.Barley x 1344 kg/ha Gyp	0.35	17.38	16.87	34.60
24. L.Barley x 2016 kg/ha Gyp	0.20	20.93	16.66	37.79

(Treatment means not significant at 0.05 level)

Leaf/Petiole and Tuber Periderm % Ca: No significant differences were observed between leaf/petiole and tuber periderm % Ca of the various treatments (Table 6). The data was similar for the green manure effects. In soils which test medium to high in Ca, tuber periderm % Ca has not been shown to be increased by further calcium additions by other workers.

TABLE 5: Effect of Four Levels of Gypsum and Four Green Manure Treatments on Incidence in Shepody Potato Cultivar.

Treatment	Yield-t/ha Tuber Area With Scab Lesions 0-10%	 >10%	 Total
Green Manures			
1. Fallow	35.44	1.16	36.60
2. Triple-Mix	33.49	0.95	34.44
3. Ryegrass	34.57	1.16	35.73
4. Leger Barley	35.59	0.99	36.58
Gypsum Rate			
5. 0 kg/ha Gypsum	36.01	0.51	36.52
6. 672 kg/ha Gypsum	34.47	1.14	35.61
7. 1344 kg/ha Gypsum	33.84	1.33	35.17
8. 2016 kg/ha Gypsum	34.77	1.29	36.06
Green Manure x Gypsum Rate			
9. Fallow x 0 kg/ha Gypsum	37.22	0.85	38.07
10. Fallow x 672 kg/ha Gyp	36.19	1.00	37.19
11. Fallow x 1344 kg/ha Gyp	36.30	0.94	37.24
12. Fallow x 2016 kg/ha Gyp	32.04	1.85	33.89
13. Trip-Mix x 0 kg/ha Gyp	34.17	0.43	34.60
14. Trip-Mix x 672 kg/ha Gyp	32.85	0.88	33.73
15. Trip-Mix x 1344 kg/ha Gyp	30.76	1.39	32.16
16. Trip-Mix x 2016 kg/ha Gyp	36.19	1.10	37.29
17. Ryegrass x 0 kg/ha Gyp	35.45	0.62	36.07
18. Ryegrass x 672 kg/ha Gyp	33.77	1.18	34.95
19. Ryegrass x 1344 kg/ha Gyp	34.44	2.22	36.66
20. Ryegrass x 2016 kg/ha Gyp	34.62	0.63	35.25
21. L.Barley x 0 kg/ha Gyp	37.20	0.14	37.34
22. L.Barley x 672 kg/ha Gyp	35.08	1.50	36.58
23. L.Barley x 1344 kg/ha Gyp	33.86	0.74	34.60
24. L.Barley x 2016 kg/ha Gyp	36.22	1.57	37.79

(Treatment means not significant at 0.05 level)

TABLE 6: Mean Leaf/Petiole and Tuber Periderm % Ca of Shepody as Affected by Four Levels of Gypsum.

Treatment	Leaf/Petiole % Ca	Tuber Periderm % Ca
1. 0 kg/ha Gypsum	0.91	0.09
2. 672 kg/ha Gypsum	0.89	0.09
3. 1344 kg/ha Gypsum	0.93	0.10
4. 2016 kg/ha Gypsum	0.87	0.08

French Fry Color, Specific Gravity and Sucrose Content: Table 7 shows the specific gravity, french fry color and sucrose content of Shepody as affected by four levels of gypsum. No significant differences were observed between the treatments. Similar values for french fry color, specific gravity and sucrose content were noted under the green manure treatments. However, the highest specific gravity, the best fry color and the lowest sucrose content were noted under 1344 kg/ha gypsum.

TABLE 7: Specific Gravity, French Fry Color and Sucrose Content of Shepody as Affected by Four Levels of Gypsum.

Treatment	Specific Gravity	Fry Color* USDA Values	Sucrose mg/g
1. 0 kg/ha Gypsum	1.069	2.6	1.3
2. 672 kg/ha Gypsum	1.074	2.3	1.6
3. 1344 kg/ha Gypsum	1.075	1.7	0.7
4. 2016 kg/ha Gypsum	1.072	2.2	0.8

* USDA color of 1-4 is acceptable by Processing Trade.

Hollow Heart and Stem-End Browning: No stem-end browning was observed in tubers from the various treatments and hollow heart was negligible.

CONCLUSION: Gypsum/green manure treatments have had no significant effect upon total yield, the various yield sized, scab incidence, hollow heart or stem-end browning. Previous observation plots had indicated that 672 and 1344 kg/ha gypsum had produced the best yields and red clover was shown to increase scab incidence compared to timothy grass. No significant differences were observed in tuber periderm and leaf/petiole % Ca. Nor were there any significant differences between the treatments in relation to specific gravity, sucrose content or french fry color, though 1344 kg/ha gypsum showed the highest specific gravity with the best french fry color and lowest sucrose content.

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REFERENCES:

1. Anderson, N.A., and Lorang, J.M. 1989. Potato Scab: An old disease presents new control opportunities. Valley Pot. Grower. December, 1988. p.14.

2. Davis, J.R., Garner, J.G., and R.M. Callihan. 1974. Effects of gypsum, sulphur, terraclor and terrador Super-X for potato scab control. Am. Pot. J. 51: 35-43.

3. Engelhard, A.W. ed. 1989. Management of Diseases with Macro and Microelements. pp 102-123, 152-166.

4. Hammerschmidt, R., Vitosh, M.L., Hanson, L.E., and M.L. Zacy. 1989. Effect of Cultural Practices on Incidence of Common Scab (**Streptomyces** **scabies**) of Potato. Am. Pot. J. 66: p. 524.

5. Hinds, R.P. 1983. Gypsum/Limestone effects upon yield of potatoes. Pot. Prod. Reports. Pot. Div. NBDA.

6. Hinds, R.P., and A.F. Perley. 1989. Preliminary observations on yield and scab incidence of Yukon Gold as affected by gypsum/green manure treatments. P.I.B. NBDA. pp 219-227.

7. Simmons, K.F., and K.A. Kelling. 1987. Potato Responses to Calcium Application on Several Soil Types. Am. Pot. J. 64: 119-136.